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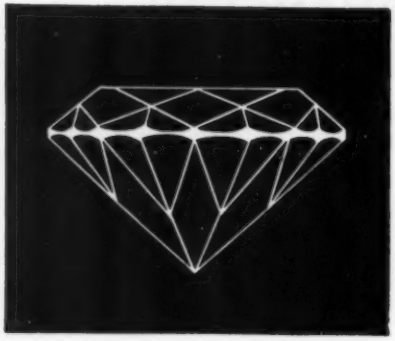

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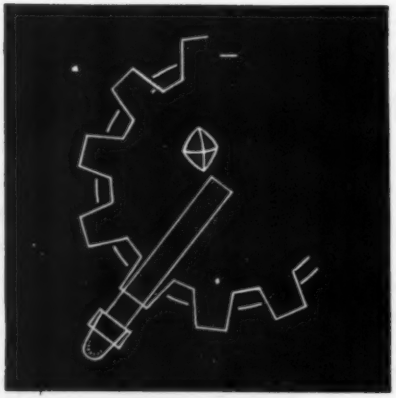

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# INDUSTRIAL DIAMOND REVIEW

**Vol 20 No 232**
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**PRINCIPAL CONTENTS**


**Generally Speaking** — **Adamant** — **45**

**Some Account of Diamond Winning Practices in Southern Africa** — **R. J. Adamson** — **46**


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## *Generally Speaking*

*Black Diamond*

Diamond distributors, Inc, of New York, have presented a 740 ct carbonado—'black diamond'—to the Smithsonian Institution. This is believed to be the largest carbonado in the United States and, probably, one of the largest in existence.

In the early days of diamond mining in Bahia, Brazil—the only source of true carbonados—miners discarded the ugly black stones as worthless. Doubtless many fortunes were thus unconsciously relegated to the refuse pit only to be recovered years later when the true nature of the carbonado was discovered.

*Be your Own Alchemist !*

The do-it-yourself craze might, we used to think, eventually die of sheer inertia. We believed that when sufficient thumbs had been hammered, the amateur might ultimately be convinced that some jobs were best left to the professional. Obviously, according to a recent announcement, we've never had it so wrong : the latest innovation is a do-it-yourself industrial diamond and garnet manufacturing machine produced in the USA by F. H. McGraw & Company. The device also produces space-age metals.

It occurs to us that by suitable manipulation of the machinery it should not be too difficult to produce diamond-impregnated space-age metals—what ever they may be.

*Diamond Recovery*

We publish this month the first section of an article in two parts on the present recovery practice in the South African, and South West African Diamond Mines. This article by R. J. Adamson, President of the South African Institute of Mining and Metallurgy and Consulting Metallurgist to the Anglo-American Corporation, is the clearest and most authoritative description of these processes yet published. It will be available in the IDR reprint series shortly.

ADAMANT

# *Some Account of Diamond Winning Practices in Southern Africa**

*By* **R. J. Adamson B.Sc. (Pretoria) M.I.M.M.**

*The Council of the South African Institute of Mining and Metallurgy has been good enough to give the Industrial Diamond Review permission to publish the Presidential Address given by Mr. R. J. Adamson on the occasion of his induction as President of that Institute last year. It gives the fullest and most up-to-date account of the methods used in the winning of diamonds that has so far appeared, and we feel that it will be of very great interest to all our readers.*

*Mr. Adamson was born in the Transvaal in 1907 and is a graduate of the University of Pretoria. He spent a considerable period of his professional life as a metallurgist in the gold mining industry of South Africa and is at present consulting metallurgist to the Anglo-American Corporation, who act as consulting engineers to the De Beers Group. He has been intimately connected with the development of many of the advanced techniques which he describes in this article, which can be considered as having the highest possible authority.*

The subject matter of this review embraces a mineral product which has a peculiar attraction for virtually every member of the community. Diamonds make their appeal to all types in the civilized world: to the artistic because of their outstanding beauty and brilliance, to the mercenary because of their great monetary value, to the practical because of their usefulness in modern industry and to the feminine sex pre-eminently as the quintessence of personal adornment. Fortunate, therefore is this country in possessing such treasure chests of these fascinating and valuable stones.

The discovery of diamonds in the Orange Free State can be considered the true forerunner of South Africa's mining industry as it exists today. Although it may be claimed that Simon van der Stel's visit to the copper deposits in Namaqualand in 1687 heralded the first interest in obtaining minerals from our native rock, nevertheless almost 200 years elapsed after that primary enterprise before mining on any perceptible scale was pursued, and then it was the search for diamonds which first stimulated South Africa's movement towards obtaining mineral wealth *per ardua ad ima*.

It is to be regretted that this Institute possesses such a scanty record in its transactions of the technical advances achieved in South African diamond mining and production. Although authoritative works have been published at different times in the past, notably ' The Diamond Mines of South Africa ' by Gardner Williams in 1902, ' The Diamond Fields of Southern Africa ' by Percy Wagner in 1914 and ' The Genesis of the Diamond ' by Alpheus Williams in 1930, few publications describe modern practices. A study of the available references[1], however, illustrates very clearly that developments in the diamond mining industry of South and South West Africa feature techniques which are invariably well in the van of world progress. These advances are continually being maintained and it is to be hoped, therefore, that papers describing recent and current achievements will be forthcoming from the members of this senior branch of our mining profession.

The present survey does not fall in such a category but aims only to present an historical outline of the origins and developments of the recovery methods employed for diamond winning.

The treatment of diamond ore is virtually in a sphere of its own, due to the peculiar conditions that apply. The essential requirements are, firstly, the attainment of a phenomenally high concentration ratio, of the order of twenty million to one, secondly, the recovery of the separate stones intact and undamaged, and, thirdly, owing to the potentially immense value of particular gems, assurance that extraction efficiency is as perfect as possible. In recent years a further consideration has been the economic extraction of minute diamond particles from the ore caused by the growing demand for industrial stones. Both in the gem and industrial diamond markets the value of the end product decreases rapidly with diminishing size and hence ' fine ' diamond recovery necessitates highly economical extraction procedures.

Reprinted from the Journal of the South African Institute of Mining and Metallurgy, Vol 60, No 1, (Aug) 1959

Unlike gold and uranium extraction, no relatively uniform treatment has been applied to diamond winning, owing to varying conditions in different localities. Consequently the methods and appliances evolved have been contrived to suit local characteristics of the diamondiferous ore and, despite a considerable degree of overlapping, quite a diversity of treatment processes has been practised.

Diamonds have been produced in Southern Africa almost entirely from the following sources:

(1) Diamond pipes at Kimberley—Dutoitspan, Bultfontein, De Beers, Kimberley and Wesselton.

(2) Diamond pipes in the Orange Free State—Jagersfontein and Koffiefontein

(3) A diamond pipe at Cullinan in the Transvaal—Premier Mine.

(4) Marine terraces on the southern coast of South West Africa—Consolidated Diamond Mines of South West Africa.

(5) Marine terraces on the coast of Namaqualand —State Alluvial Diggings at Alexander Bay and Kleinzee Mine near Port Nolloth.

(6) Alluvial diggings and kimberlite fissures—Occuring mostly in the north-western Cape Province, the south-western Transvaal and the western Orange Free State.

From the treatment aspect these six sources embrace three main types of ore, viz., kimberlite, marine terrace deposits and alluvial gravels.

Kimberlite constitutes the ore-body in the volcanic pipes and fissures. It consists of a bluish-grey matrix composed largely of serpentine together with various subsidiary minerals, including calcite, diopside, enstatite, ilmenite, phlogopite, pyrite, pyrope and very occasionally a diamond. The kimberlite ores from the pipes at Kimberley, Jagersfontein and Koffiefontein are generally alike—but differ somewhat, particularly in hardness, from that at Premier Mine. Kimberlite has to be disintegrated by suitable means to release the contained diamonds before extraction procedures can be applied.

Marine terraces contain layers of boulders, pebbles and grit, all round by sea action, resting on a shale bedrock and covered with sand. Oyster and musselshells are frequently present. The pebbles mainly consist of quartz accompanied by varying amounts of banded ironstone. Calcedony, epidote, felspar, garnet and jasper also occur. Sand not only forms the overburden but is disseminated throughout the gravel layers. No crushing or other method of comminution is required prior to the recovery process as diamonds exist as separate entities among the constituents of the gravels. A preliminary screening separation, however, is necessary to discard boulders, large pebbles and sand before treatment of the gravel proper.

Alluvial gravels usually comprise an unstratified but well defined band containing locally derived boulders mixed with small pebbles consisting principally of chert, quartz, quartzite, chalcedony, jasper and banded ironstone. These deposits, found at depths from a few inches to many feet below surface, are somewhat similar to the strata in the marine terraces but usually have a smaller size range of constituents and contain fine silt instead of the sand that occurs in the beach gravels. Here again the diamonds are not encased in any way and preparation for treatment consists, as in the case of beach terraces, merely of a screening separation to remove the fine silt and oversize boulders.

*Summary of diamond discoveries*

Diamond production in Southern Africa commenced in 1866 when a 21¼ carat stone was picked up by a 15 year old boy, Erasmus Stephanus Jacobs, on the farm De Kalk, near Hope Town. It was subsequently sold in 1867 by the trader, J. O'Reilly, to the Govenor of the Cape. For long known as the O'Reilly stone, it was later christened the ' Eureka.'

Its discovery stimulated some interest in diamond prospecting in the Orange Free State and a few sporadic finds followed. However, the real beginning of the diamond rush to the banks of the Vaal and the Orange Rivers ensued after a Griqua shepherd found a pure white stone of 83½ carats in March, 1869, again in the Hope Town area. Of this gem, named ' The Star of Africa,' Sir Richard Southey, then Govenor of the Cape, uncannily prophesied ' This diamond is the rock upon which the future success of South Africa will be built.'

The earliest diggers concentrated their attention on the alluvial deposits along the banks of the Vaal River, chiefly around the district that now constitutes Barkly West, about 20 miles north-west of Kimberley. Eighteen months later, in August 1870, diamonds were found at Jagersfontein near Fauresmith in the Orange Free State. The news of this discovery had hardly been made public when diamonds were also discovered in September at what later proved to be Dutoitspan Mine. Early the next year Bultfontein was located, with De Beers following in May and the Kimberley pipe in July, 1871. Thus, within the space of 12

months, the sites of five of the eight major diamond pipes in South Africa had been disclosed. The four pipes at Kimberley were first mined by a multitude of individual claim holders, but eventually, through the efforts of Cecil Rhodes, a joint controlling organization was formed under the title of De Beers Consolidated Mines, Limited, which over the period 1887 to 1889 took charge of mining and treatment operations at the Dutoitspan, Bultfontein, De Beers and Kimberley pipes. When shortly afterwards the Wesselton pipe was found in 1891 it was also incorporated in the De Beers Company.

Jagersfontein was developed from 1888 onwards by the New Jagersfontein Mining and Exploration Company and, although the De Beers Company became its consulting engineers in 1931, it remained a separate entity until leased by De Beers Consolidated Mines, Limited, in 1940.

Soon after the original discoveries at Jagersfontein, some diamonds were found on another Free State farm. Koffiefontein, but it was not until 1880 that a pipe was thought to exist at this site. In 1892 a company with the title Koffiefontein Mines, Limited, was constituted and mining proper commenced under the direction of the De Beers organization. Operations at Koffiefontein, however, ceased in 1932 and at present this mine is dormant.

Many other pipes were found in the two decades from 1880 to 1899 in the Cape Province and Orange Free State but they rarely proved payable and virtually all have been abandoned.

From the original fields at Barkly West, alluvial diggers extended their activities to the south-western Transvaal and have operated there to a fluctuating extent ever since. Some of these migrant diggers unearthed gravels further east in the Pretoria district and from their workings the discovery of Premier Mine followed in December, 1902.

In South West Africa diamonds were first discovered during 1908 in the sandy regions around Luderitzbucht and soon afterwards several German companies were formed to mine the deposits found in this area. Prospecting and exploitation over the ensuing years established the existence of diamondiferous marine terraces practically along the whole coast line between Luderitzbucht and the mouth of the Orange River. The various companies operating in these territories were amalgamated by Sir Ernest Oppenheimer in 1920 under the title of The Consolidated Diamond Mines of South-West Africa.

At Kleinzee, south of Port Nolloth, Namaqualand, diamonds were found in marine terraces in August 1925, and this discovery led to another at Alexander Bay, just south of the Orange River mouth, in November, 1926. The Kleinzee terrace was mined by the De Beers organization until its exhaustion in 1957. The Alexander Bay beach gravels, which extend southwards to Port Nolloth, are still being worked by the Government Mines Department under the title of the State Alluvial Diggings.

Inland alluvial diggings in South Africa have been prolific in number, but probably the most productive were those in the Barkly West Bloemhof and Lichtenburg districts. Since the decline of activities in this last area from 1932 onwards, the output of alluvial diggers has been of less and less account in South African diamond production.

It is interesting to note how the original large producers have maintained their leadership in output despite the fact that the Kimberley Mine is extinct and both the De Beers and Koffifontein Mines are dormant. The production of diamonds in South and South-West Africa in 1958 amounted to some 3.6 million carats, of which approximately 55% were gems and 45% were industrial stones. The contribution to this total can be allocated roughly as follows:

**Table 1**

| | |
|---|---|
| (1) De Beers Consolidated Mines (including Jagersfontein) | 27% |
| (2) Premier (Transvaal) Diamond Mining Company | 35% |
| (3) The Consolidated Diamond Mines of South-West Africa | 25% |
| (4) State Alluvial Diggings | 8% |
| (5) Small mines and alluvial diggings | 5% |

*Evolution of concentration methods*

The weight of 3,600,000 carats is equivalent to about 1,600 pounds avoirdupois or four-fifths of a ton. This amount represents the output derived from the mining of over sixteen million tons of ore.

The proportion of diamonds present in both kimberlite and coastal gravels varies from one in twelve million to one sixty million parts by weight. One in twenty million is probably a reasonable average. No statistics for alluvial diggings are available but presumably similar figures are applicable. The scarcity of the diamond content in relation to the ore mined will be appreciated when it is realized that the

proportion of uramium oxide in pulp treated in local uranium plants is about one part in four thousand, and for gold the corresponding figure is one in a hundred and fifty thousand.

To attain a concentration ratio of twenty million to one at the same time preserving unblemished the physical identity of the precious constituent of the matrix, requires special mineral dressing measures. These achieve the desired results by stages. At each step an enriched fraction containing the diamonds is separated from a barren portion of the ore. The latter is discarded and the former passes to the next concentrating stage. When diamonds were first sought in 1871, a single step was employed, viz. hand-sorting. This method was only applicable to exceptionally high grade ores or as a haphazard and entirely uneconomic means of recovery. Very soon, therefore, the early diggers introduced an additional treatment stage which was accomplished by using a washing cradle to effect a preliminary concentration of the gravels. Although this apparatus bore some resemblance to the batea used for diamond winning in Brazil, it was actually adapted from Australian and American alluvial gold mining practices. This crude device was employed until the rotary washing pan was developed in 1874.

The origin of rotary washing pans presents an interesting and unsolved subject of historical research. Otherwise well documented accounts of the early developments at Kimberley surprisingly omit reference to what obviously should have been a matter of primary interest and pride.

Washing pans immediately provided a much more efficient and higher degree of concentration than did the cradles; so much so that with some modifications they are still utilized in modern diamond treatment plants both in South Africa and elsewhere. Smaller models still constitute the essential equipment of the alluvial digger. Pans are also employed currently in other mineral dressing fields, including the concentration of tin and chromite ores. Their continued use for diamond winning is a tribute to the perspicacity of the pioneers who adopted them, illustrating that a well conceived concentration process based on principles naturally suited to the ore and mineral concerned is likely to have enduring qualities. Treating diamondiferous gravels with rotary washing pans falls in this category. So also does recovering coarse gold particles by corduroy tables or riffled concentrator belts such as are installed in many modern gold mines. These devices are only an adaptation of Jason's golden fleece, a sheep skin used to collect gold particles from river sands in pre-Christian eras.

The segregation of heavy minerals from the gangue by washing pans is especially effective if an adequate portion of clay is available to form a wet suspensory pulp or 'puddle,' which helps to carry the lighter constituents of the ore over the tailings weir without interfering with the settling of heavy minerals to the bottom of the pan. The kimberlite from the pipes at Kimberley, Jagersfontein and Koeffiefontein, particularly the original 'yellow ground,' was well endowed with puddle-forming material.

*Fig 1. The original rotary washing pan —1874.*

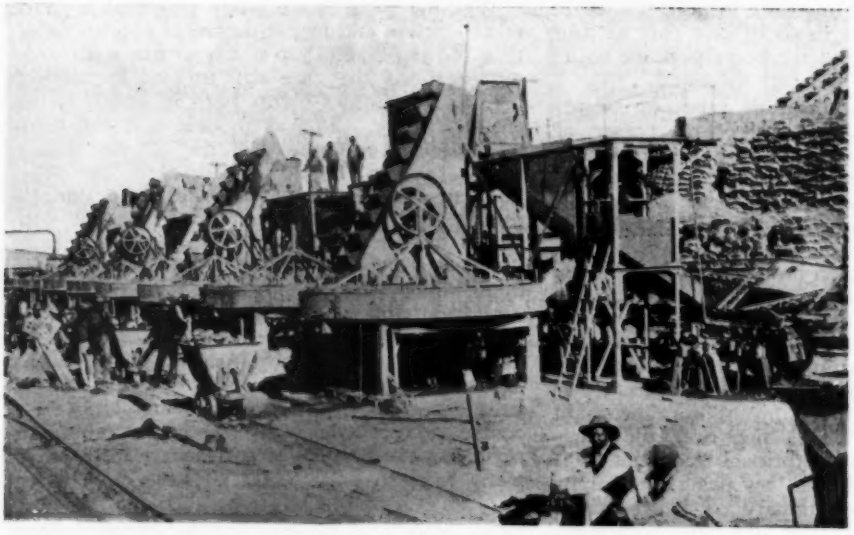

*Fig 2. No 1 Washing machine : De Beers Mine—1899.*

The early hand-turned washing pan was the forerunner of the mechanically operated pan plants which were erected at the various mines in Kimberley soon after the De Beers Company took charge of their operations in 1888 and 1889 (Figs 1, 2 and 3).

In addition to installing these mechanized pan plants, the company inaugurated a further concentration stage by the introduction of Harz jigs which were designed to re-concentrate the washing pan concentrates prior to hand-sorting. Furthermore, in recognition of the advantages of centralization, the jigging installation which had originally been provided only to handle the concentrates from the washing plant at the De Beers pipe, was increased in size to receive the concentrates from all the other washing plants. On account of the pulsating action of the Harz jig this section became known as the ' pulsator ' (Fig 4).

Despite, however, the concentration achieved by the pans and jigs, the enormous tonnages

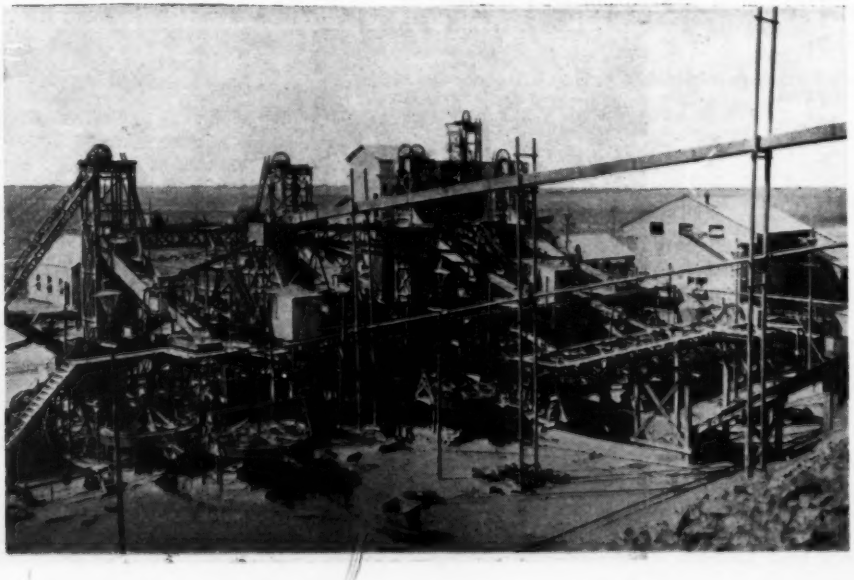

*Fig 3. No 2 Washing machine : Kimberley floors—1899.*

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*Fig 4. Exterior of pulsator: De Beers Consolidated Mines, Ltd—1924.*

mined from the four, and later five, pipes still presented a huge sorting procedure which required an exceptionally large staff in the sort house.

With the object of reducing the extent of this operation, an organized research programme, not dissimilar to present-day work study practice, was instituted by management in 1896. The campaign was crowned with success when grease tables were originated by F. Kirsten, the deputy leader of the research team. The results at once reduced hand-sorting to a minor concentration step and the sorting office replaced the sort house.

With the successive introduction of washing pans, jigs and grease tables prior to hand-sorting, diamond winning by this time comprised four main stages of steps. The ratios effected by each were approximately:

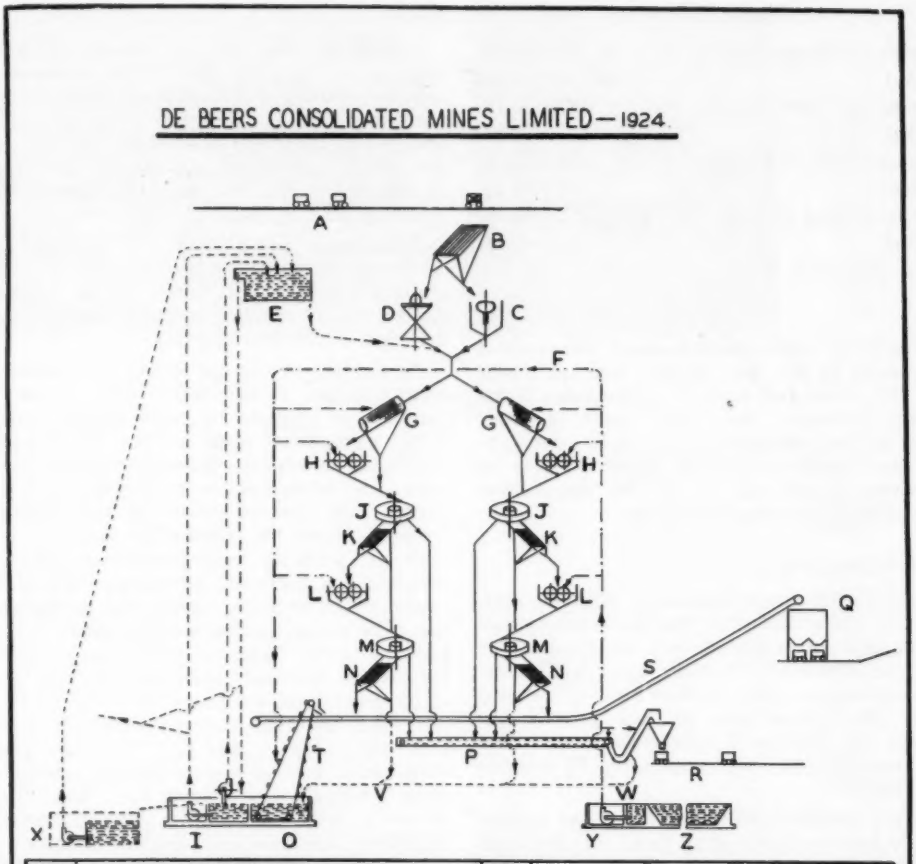
**Table II**

| | | | | |
|---|---|---|---|---|
| Washing pans | 66.6' | : | 1 | (Concentrate to jigs) |
| Jigs | 6 | : | 1 | (Concentrate to grease tables) |
| Grease tables | 8,000 | : | 1 | (Concentrate to hand-sorting) |
| Hand sorting | 6 | : | 1 | (Concentrate—diamonds) |
| Total ratio | 19,200,000 | : | 1 | |

It will of course be appreciated that the greatest discard in actual weight of gangue is accomplished in the earlier stages of concentration and, although the grease recovery ratio appears the most spectacular, the tonnage rejected at this stage is only 0.25% of that discarded by the washing pans.

The tabulation of concentration ratios can be shown in an alternative from:

*Fig 5. Central washing plant: De Beers Consolidated Mines, Ltd—1924.*




| REF. | DESCRIPTION. | REF. | DESCRIPTION. |
|---|---|---|---|
| A | 100 LOADS PER HOUR EACH UNIT. | O | SETTLING TANK. |
| B | GRIZZLEY 2" SPACES. | P | SCRAPER CONV.FOR CONCENTRATES. |
| C | FEED TABLE. | Q | TAILINGS BIN. |
| D | 6 K. CRUSHER. | R | CONCENTRATES TO PULSATOR. |
| E | PUDDLE TANK. ONE PER 8 UNITS. | S | TAILINGS BELT. |
| F | MAKE UP CLEAN WATER. 100 GAL. PER. LOAD. | T | SILT ELEVATOR. |
| G | 1" SCREENING CYLINDERS. | W | WASH WATER OVERFLOW. |
| H | COARSE ROLLS. | V | MUDDY WATER. |
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| M | FINE PANS. | | |
| N | 1/8" SCREEN. | | |

*Fig 6. Central washing plant : Flow diagram—De Beers Consolidated Mines, Limited.*

**Table III**

| | |
|---|---|
| Kimberlite to washing pans | 19,200,000 lb |
| Discarded | 18,912,000 lb |
| Balance to jigs (1/66.6') | 288,000 lb |
| Discarded | 240,000 lb |
| Balance to grease table (1/6) | 48,000 lb |
| Discarded | 47,994 lb |
| Balance to sorting office (1/8,000) | 6 lb |
| Discarded | 5 lb |
| Balance—diamonds (1/6) | 1 lb |

This series of concentration stages was evolved at Kimberley in the last century and no major link in the chain has since been forged. Some advances, however, have been made in their manner of accomplishment. Such developments have comprised either improvements to the devices already in use or the application of new mineral dressing techniques.

*Primary concentration*

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Ultimately the separate plants operating at each mine in Kimberley were replaced by a central washing installation designed to handle the ore from all the producing mines (Figs 5 and 6). In its initial operations another attempt was made to include jigs in the primary concentrating circuit, but soon afterwards the jigs were replaced by pans.

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At the end of the last world war, experiments were initiated at Kimberley with a view of replacing pan washing by heavy media separation. After exhaustive tests it was established that under the conditions prevailing at the De Beers mines the economics were slightly in favour of pans. The cost of removing the natural clay medium from the kimberlite and replacing it with an artificial medium—ferro silicon—outweighed any potential advantages offered by the heavy media process. Thus the replacement of the 1924 model central washing plant by a more modern 1958 version which again embraced pans was a practical indication that over a period of 85 years these machines were still found to be the most suitable concentrators for the local kimberlite (Figs 7 and 8). The new plant incorporated several improvements among which were a tertiary pan circuit for 'fine' diamond recovery, centralized puddle control, dust allaying measures, separate closed-circuit secondary crushing arrangements and continuous extraction of pan concentrates.

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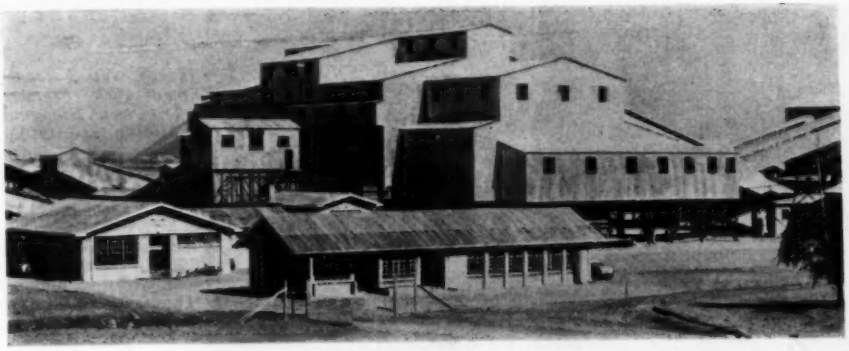
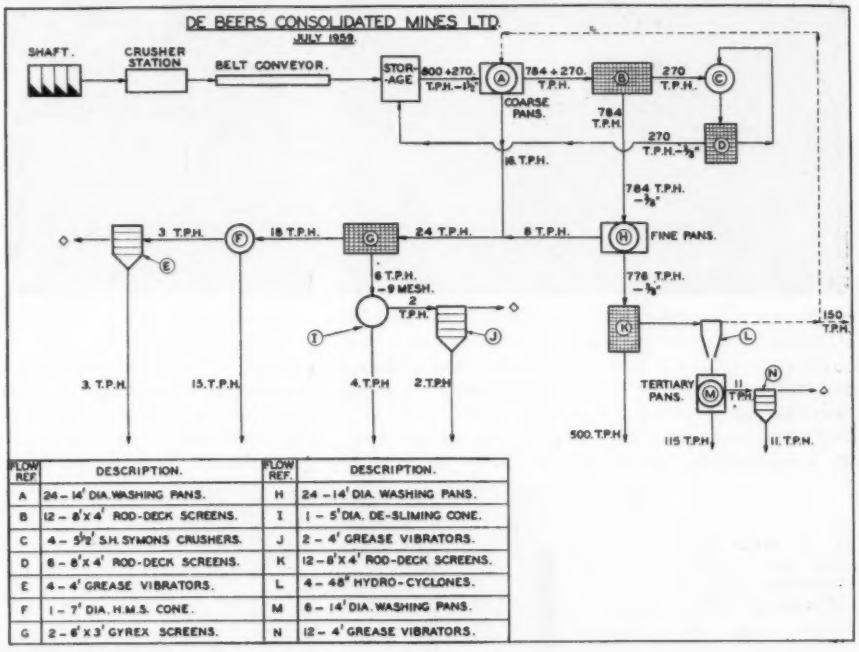


*Fig 7. Central treatment plant : De Beers Consolidated Mines, Limited—1958.*

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| G | 2 – 6'x3' GYREX SCREENS. | N | 12 – 4' GREASE VIBRATORS. |

*Fig 8. Central treatment plant : Flow diagram—De Beers Consolidated Mines, Limited.*

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At Premier Mine washing pans were initially installed at the inception of operations in 1903, and by 1906 three plants or ' gears ' were established, all incorporating rotary washing pans (Fig 9).

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**Table III**

| | |
|---|---|
| Kimberlite to washing pans | 19,200,000 lb |
| Discarded | 18,912,000 lb |
| Balance to jigs (1/66.6') | 288,000 lb |
| Discarded | 240,000 lb |
| Balance to grease table (1/6) | 48,000 lb |
| Discarded | 47,994 lb |
| Balance to sorting office (1/8,000) | 6 lb |
| Discarded | 5 lb |
| Balance—diamonds (1/6) | 1 lb |

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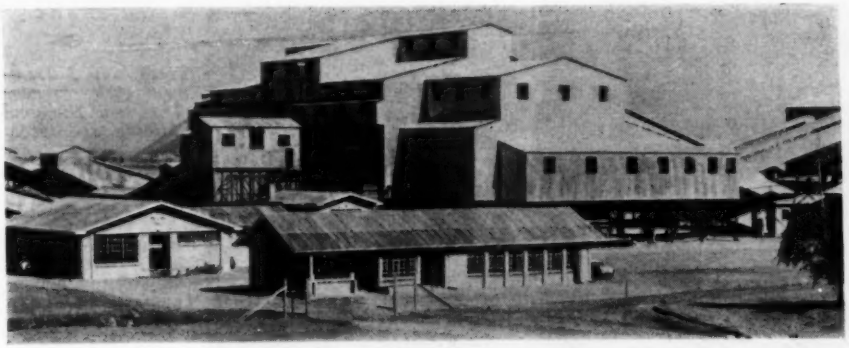

*Fig 7. Central treatment plant : De Beers Consolidated Mines, Limited—1958.*

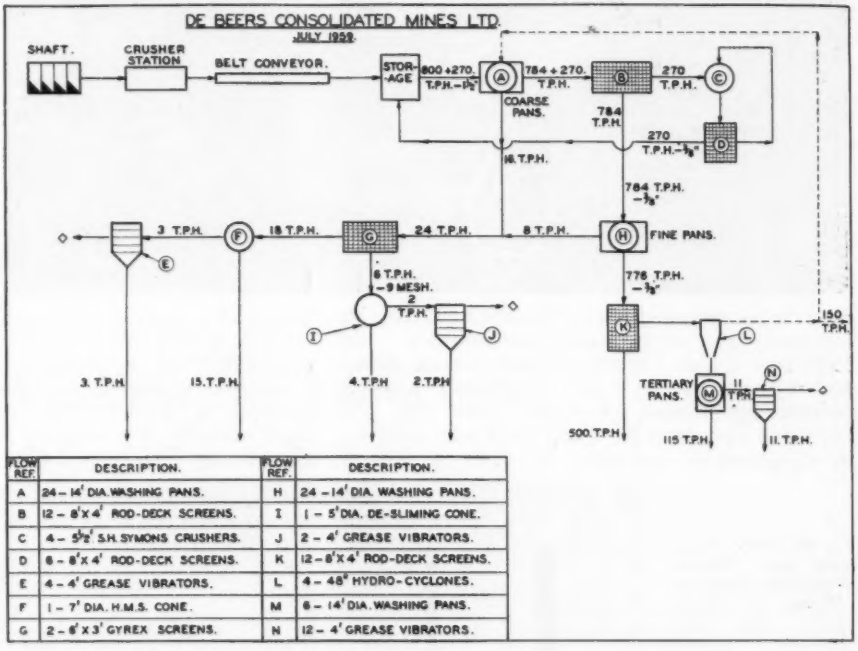


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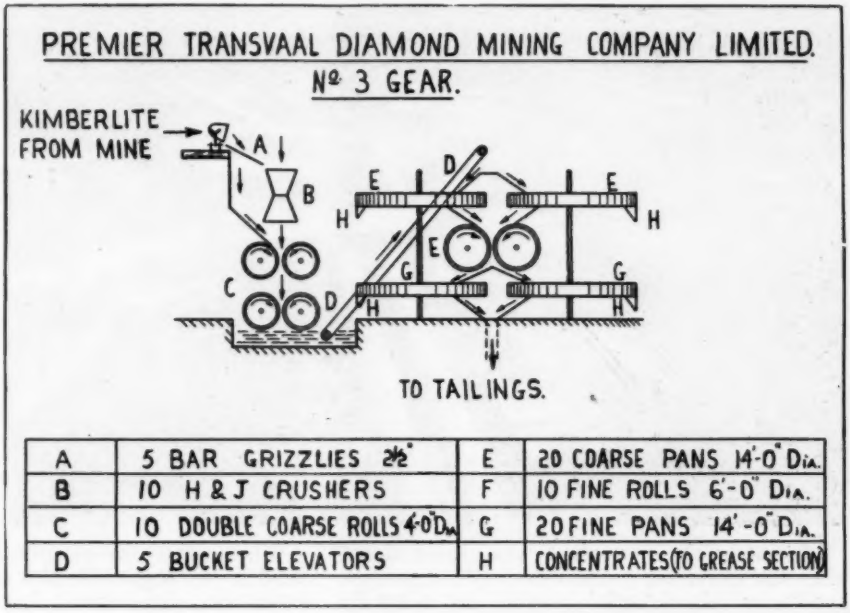
*Fig 9. No 3 Treatment gear: Premier (Transvaal) Diamond Mining Co—1906.*

ore was encountered it also became preferable to introduce jigs as primary concentrators. By 1909 Nos 1 and 2 gears had been closed down and replaced by No 4 gear which incorporated pulsion jigs instead of rotary pans (Fig 10). For some years both No 3 and No 4 gear operated in conjunction, attaining in 1911 a record throughout of nearly 8½ million tons.

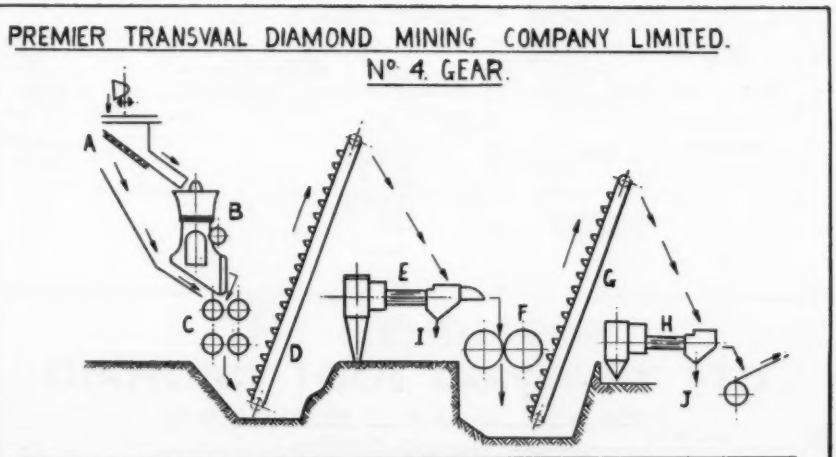
Both plants were models of compactness, symmetry and streamlined flow and despite modern engineering criticisms may also be regarded as excellent examples of certain advantages afforded by adopting bucket elevators in plant design (Figs 11 and 12).

*Fig 10. No 4 Treatment gear: Premier (Transvaal) Diamond Mining Co—1910.*




| | | | |
|---|---|---|---|
| A | 5 BAR GRIZZLIES 2½" | E | 20 COARSE PANS 14'-0" Dia. |
| B | 10 H & J CRUSHERS | F | 10 FINE ROLLS 6'-0" Dia. |
| C | 10 DOUBLE COARSE ROLLS 4'-0" Dia. | G | 20 FINE PANS 14'-0" Dia. |
| D | 5 BUCKET ELEVATORS | H | CONCENTRATES (TO GREASE SECTION) |

*Fig 11. No 3 Treatment gear: Flow diagram: Premier (Transvaal) Diamond Mining Co.*




| | | | |
|---|---|---|---|
| A | 6 BAR GRIZZLIES 2½" | F | 14 FINE ROLLS 6'-0" Dia. |
| B | 12 H & J CRUSHERS. | G | 7 BUCKET ELEVATORS 60" WIDE |
| C | 6 DOUBLE COARSE ROLLS 4'-0" Dia. | H | 28 FINE PULSION JIGS. |
| D | 7 BUCKET ELEVATORS 60" WIDE. | I | COARSE CONCENTRATES (TO GREASE) |
| E | 28 COARSE PULSION JIGS. | J | FINE CONCENTRATES TO GREASE. |

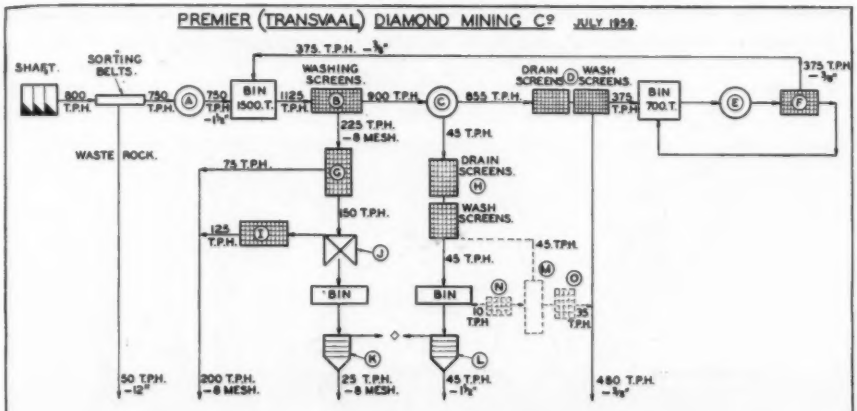
*Fig 12. No 4 Treatment gear: Flow diagram: Premier (Transvaal) Diamond Mining Co.*

*Fig 13. Treatment plant : Premier (Transvaal) Diamond Mining Co—1950.*

Ultimately the pan plant was closed down when the increasing proportions of blue ground, known as ' hardebank ' resulted in a totally inadequate provision of puddle-forming fines. The jig plant continued to operate until production was suspended in 1932 due to the slump in the diamond market.

When, after the second world war, it was decided to reopen Premier Mine, heavy media separation, also termed ' sink and float ' and later more succinctly ' high d ' had emerged as a rival to jigging for concentration of ores coarser than 1/16 in. diameter in particle size. Laboratory tests conducted at Kimberley showed that

*Fig 14. Treatment plant : Flow diagram : Premier (Transvaal) Diamond Mining Co.*




| FLOW REF. | DESCRIPTION. | FLOW REF. | DESCRIPTION. |
|---|---|---|---|
| A | 3 – 5½' SYMONS CRUSHERS. 2 – 4½' | G | 4 – 8' x 15' RAKE CLASSIFIERS. |
| B | 8 – 16' x 5' LOW HEAD SCREENS. – DOUBLE DECK. | H | 8 – 10' x 3' LOW HEAD SCREENS. SINGLE DECK. |
| C | 4 – 16' DIA. H.M.S. CONES. | I | 4 – 8' x 15' RAKE CLASSIFIERS. |
| D | 16 – 10' x 5' LOW HEAD SCREENS. DOUBLE DECK. | J | 8 – 24" x 36" DENVER JIGS. |
| E | 6 – 5½' S.H. SYMONS CRUSHERS. | K | 8 – 4' FINE GREASE VIBRATORS. |
| F | 12 – 8' x 5' ROD-DECK SCREENS. | L | 20 – 4' MEDIUM & COARSE GREASE VIBRATORS. |
| M, N, O. PROJECTED SECONDARY HEAVY MEDIA CIRCUIT : | | M. | 13' x 5' DRUM SEPARATOR. |
| | | N. | 10' x 3' SCREEN. SINGLE DECK. |
| | | O. | 14' x 5' LOW HEAD SCREENS. DOUBLE DECK. |

the new technique had considerable promise and therefore a pilot heavy media separation plant with a capacity of 100 tons per hour was erected at Premier Mine in 1947. Highly satisfactory performance was obtained from this pioneer installation and the climax of nearly five years of laboratory and pilot plant research was reached with the commissioning of the 13,000 tons per day plant at Premier Mine in 1950 (Figs 13 and 14). Its inception represented the first production application of heavy media separation to diamond winning, also the first heavy media operation in Africa and, in throughput of tonnage, the largest heavy media cone plant in the world. An additional feature of its inauguration was the provision of the essential ferro-silicon medium by local foundries, thus obviating dependence on supplies from overseas.

*To be concluded*

## *News in Brief*

Alexei Kosygin, Vice-Chairman of the USSR Council of Ministers, reporting to the Supreme Soviet on the 1960 State Plan for the development of the national economy of the USSR, has stated that the programme provides for a further increase in the output of diamonds.

The economic council of Yakutia, Eastern Siberia, has planned the development of a major diamond centre round the Mir kimberlite pipe, which was discovered in 1955 and already yields large quantities of diamonds. Its enterprises will reach full capacity within the next five or six years.

At the Mir pipe an opencast working and a kimberlite ore mine already operate, as well as crushing installations and two diamond extracting plants. A power station, hundreds of dwellings, schools and club premises have been built there.

Mirny, the diamond workers' town, now has a population of 10,000. Powerful electric draglines, special drilling rigs and other up-to-date mining machinery will be put into operation there, and the town's population will double or treble by 1965.

Israel's first centre for the polishing of precious and semi-precious stones, opened in Jerusalem on November 11, 1959, and which is to employ 20 persons in its initial stage, was established by the Jerusalem Economic Corporation, by a Dutch expert in the processing of precious stones, J. Van Harten, and by E. Engel of the USA. The initial investment in the undertaking will be over I£100,000.

Diamond production in the Soviet Union is to increase sixteen-fold by 1965 as compared to 1958. This is expected to largely meet the country's domestic requirements.

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## ADVERTISERS' INDEX


| | Page |
|---|---|
| Compentrad, Ltd. ... ... ... ... ... | 51 |
| Diamant Boart ... ... ... ... ... | 42 |
| Diamond News, The ... ... .. ... | 60 |
| Drukker, D. & Zn. N.V. ... ... ... ... | 44 |
| Habit Diamond Tooling Ltd. ... ... | Cover III |
| Henderson Diamond Tool Company, Ltd., The | 59 |
| Impregnated Diamond Products Ltd. ... | Cover IV |
| Indusmond (Diamond Tools) Ltd ... ... | 43 |
| Industrial Diamond Co. (Sales) Ltd. ... | Cover II |
| Smit, J. K. & Sons (Diamond Tools) Ltd. ... | 41 |
| Triefus & Co. Ltd. ... ... ... ... | Cover I |
| Wolverhampton Diamond Die & Tool Co. Ltd. | 43 |


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# INDUSTRIAL DIAMOND ABSTRACTS

Industrial Diamond Information Bureau,
2 Charterhouse Street, London, EC 1.
Telephone : FLEet Street 1577

1960 Volume 17
MARCH

## DIAMOND MINING AND INDUSTRY

**New discoveries in Yakutia**

Anon. *Industr Diam Rev* 1959 Vol 19 (227) p 194 (Oct)

A diamond placer has been discovered by Leningrad geologists in the far northwest of the Yakutian Autonomous Republic, in Eastern Siberia. It has been traced along a 43 mile stretch. The geologists have also discovered 3 kimberlite pipes indicating real prospects for a further search for rich diamond deposits. Prospecting is to be continued in 1960.

*X* *Eb F.322*

**Geological structure and diamond content of the SW region of the Siberian plateau**

Anon. *Sowjet Buchneuerschein Vorankuendigungsdienst* 1959 (42) p 11 (Original in Russian)

Book, Isd-wo AN SSR, 1960, 144 pp. Price DM 3.25.

The following problems are examined : geological structure, tectonics and magnetics of the new diamondiferous Tschuno-Birjussinsker area ; characteristics of diamond deposits ; mineralogy of the diamond and the structure of the heavy ores in which paragenetic minerals accompanying diamond are found.

[Not in library of Industrial Diamond Information Bureau]. *A* *Ebe.33/F Vwd*

**Brief outline of the geology of the USSR.** Kurzer Abriss der Geologie der UdSSR

D. W. Naliwkin. *Nova* 1960 (1) p 15 (Jan) (In German)

Book, Akademie Verlag, Berlin, 1959, 164 pp, illustr. Price DM 17.50. (In Russian, abstr in German).

The book gives a brief outline of the most important results of geological investigations made in the USSR and the conclusions that can be drawn from them.

[Not in library of Industrial Diamond Information Bureau]. *K* *Vwc .33*

**Venezuelan diamond industry**

Anon. *Industr Diam Rev* 1959 Vol 19 (227) p 198 (Oct)

Venezuela's diamond production is reported to have averaged 87,559 cts a year over the past ten years. Production and export figures for 1958 are given.

*D* *F.25.347*

**Alluvial diamond returns for July and September 1959**

Anon. *Diamond News* 1959 Vol 22 (12) pp 33-34 (Sep) ; Vol 23 (2) pp 33-34 (Nov)

Rough and uncut diamond production in July 1959 for Cape Province : 6,245.00 ct of total value £58,845 (188s 5d per ct) ; Private Estates : 204.00 ct of total value £3,125 (306s 4d per ct) ; Transvaal Province : 12,489.00 ct of total value £36,676 (58s 9d per ct). Thus total production amounted to : 18,938.00 ct of total value £98,646 (103s 3d per ct).

Rough and uncut diamond production in September 1959 for Cape Province : 4,940.75 ct of total value £42,529 (172s 2d per ct) ; Private Estates : 252.00 ct of total value £2,738 (222s 7d per ct) ; Transvaal Province : 18,236.25 ct of total value £52,515 (57s 7d per ct) ; Thus total production amounted to : 33,429.00 ct of total value £97,782 (58s 6d per ct).

*M* *Ebe F.13.361*

**This week's product perspective**

Anon. *Purchasing Week* 1959 Vol 2 (52) p 17 (Dec 28)

Comments on recent announcements by GEC and De Beers on the production of synthetic diamonds for industry. *D* *Fh.13*

**Israeli trade statistics**

Anon. *Industr Diam Rev* 1959 Vol 19 (227) p 194 (Oct)

Diamond export figures for 1959, up to August, and comparison with 1958 figures.

*D* *F.251.351*

**The diamond industry of Belgium**

Anon. *Gemmologist* 1959 Vol 28 (341) p 230 (Dec)

Belgium imports and exports of diamonds during July 1959. *D* *F.25.3235*

**Diamond prospecting rights in Griquatown**

Anon. *Diamond News* 1959 Vol 23 (3) p 32 (Dec)

Griquatown's future may lie in diamonds. A Johannesburg firm has asked for prospecting rights in both the municipal area and district. The Town Council has agreed and it now remains for the Government to give its permission.

*X* *F.12.361*

## CONTENTS


| | | | |
|---|---|---|---|
| Diamond Mining and Industry... ... ... | A57 | Rock Drilling ... ... ... ... ..... | A73 |
| Physical, Chemical, and Mechanical Properties of Diamond ... ... ... ... ... | A58 | Wire Drawing ... ... ... ... ... ... ... | A75 |
| Physical, Chemical, and Mechanical Properties of Hard Materials ... ... ... ... | A60 | Grinding and Polishing of Carbides and Metals | A76 |
| Diamond, etc, in Instruments ... ... | A62 | Machining Developments ... ... ... ... | A81 |
| Hardness and Wear Testing ... ... ... | A63 | Production, Grading and Recovery of Abrasive Particles ... ... ... ... ... | A82 |
| Truing of Grinding Wheels ... ... ... ... | A64 | Tool Production... ... ... ... ... | A82 |
| Precision Machining of Metals ... ... | A68 | Powder Metallurgy ... ... ... ... | A84 |
| Cutting and Machining of Stone, Glass, etc ... | A71 | Miscellaneous ... ... ... ... ... | A85 |
| Gem Polishing ... ... ... ... ... | A73 | Book Reviews ... ... ... ... ... | A86 |
| | | Trade Literature ... ... ... ... | A86 |
| | | Patent Lists ... ... ... ... ... ... ... | A87 |

**De Beers Co to sell Pypklip claims by auction**

Anon. *Diamond News* 1959 Vol 23 (3) p 7 (Dec)

The directors of De Beers Consolidated Mines Ltd have now decided not to accept any of the tenders submitted for the purchase of the owner's and discoverer's certificates covering 295 claims on the farm Pypklip, but to put up the claims in lots for sale by public auction.

See *Industr Diam Abstr* 1960 Vol 17 p A29 (Feb).

*D* *Eb.251.361*

**World mineral production in 1958**

Anon. *S Afr Min (Engng) J* 1960 Vol 71 Pt 1 (3492) pp 49-51 (Jan 8)

Includes diamond production figures, gem and industrial, comparing them with yearly averages since 1954. 1 table. *D* *Bc.13.31/F.13.31*

**Strategic stockpile—how it can affect prices**

Anon. *Purchasing Week* 1960 Vol 3 (3) pp 16-17 (Jan 18); *Diamond News* 1959 Vol 23 (3) p 15 (Dec)

A discussion of the US Government's strategic materials stockpiling policy. In the National Stockpile, small diamond dies are among the ten items that have not yet reached the three year goals. The only items on the purchase list for 1960 are asbestos, diamond dies and jewel bearings.

*D* *Nkb.141.324/Tc.141.342*

**No import control on diamond dies**

Anon. *Diamond News* 1959 Vol 23 (3) p 15 (Dec)

Diamond dies are among a large number of items which the British Government is freeing from import controls. *X* *Nkb.251*

**U.S. steel strike may affect industrials**

Anon. *Diamond News* 1959 Vol 23 (3) p 15 (Dec)

Industrial diamond sales to the United States may slacken during the rest of the year because of the steel strike, according to the Central Selling Organisation. Some diamond tool makers, it is reported, say the strike has curtailed machining operations in industries using large quantities of diamonds.

*D* *Fc.25.342*

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## PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF DIAMOND

**Interferometric studies on synthetic diamonds**

S. Tolansky, I. Sunagawa. *Nature, Lond* 1960 Vol 185 (4708) pp 203-204 (Jan 23)

Owing to the micro-character and irregular shape of the material, only two-beam interferometry has succeeded so far, but attempts to apply multiple-beam interferometry continue. Two samples were studied: one revealed many cubic as well as octahedral faces, the other crystals, perhaps twice as large linearly (some 1/5 mm), were almost all octahedra. Interferograms from each sample are considered. 1 illustr.

*D* *Fh Vr.21*

**Many electron examination of the hole zone in diamond-type crystals**

E. I. Kaplunova. *Soviet Phys, Solid State* 1959 Vol 1 (2) pp 157-165 (Feb) (Original in Russian)

1 illustr, 8 ref. *D* *Bdf Vjf*

**X-ray determination of the electron distribution in crystals. VII Electron depths in the diamond lattice and in that of silicon.** Roentgenographische Bestimmung der Elektronenverteilung in Kristallen. VII Die Elektronendichten im Diamantgitter und im Gitter des Siliziums

S. Goettliches, E. Woelfel. *Z Electrochem* 1959 Vol 63 (8) pp 891-901 (Nov) (In German)

X-ray intensity measurements of fine particle diamond dust led to atomic amplitudes of the bonded carbon atom, which dittered for interferences (111), (311), (400), and (331) with regard to the smooth curve of the atomic amplitudes of the free carbon atom calculated at room temperature. The atomic amplitudes of bonded silicon atoms differ for the interferences (111), (400), and (331) in the same way as from the smooth curve of the atomic amplitudes of the free silicon atom. With regard to the 'forbidden' interference (222), the electron distribution for both lattices was calculated in the *xxz* plane, the phase of the forbidden interference (222) being chosen in such a way that the electron depths at all lattice points are positive. The electron depths in the centre of the connecting line of two neighbouring parts are in the diamond lattice 1.67 $\pm 0.01$ El/AU$^3$ and in the silicon lattice 0.57 $\pm 0.04$ El/AU$^3$. The depth distribution according to Hartree was also calculated.

The electron depths distribution in the diamond lattice were compared with the depths obtained by wave mechanical methods by P. P. Ewald and H. Hoenl. Their model is closer than that of Hartree to the spherical symmetrical charge distribution. On the basis of this comparison the following picture of the diamond lattice is formed: the charge centres form a lattice of the crystobalite type. Spherical symmetrical charge distributions of the kernels of carbon atoms correspond with the silicon atoms in the $SiO_2$ lattice. These kernel charges contain besides the two $K$— electrons also 3.16 $L$— electrons. The depth contributions of $K$— and $L$— components are given. Axial symmetrical charge distributions in the bonds in the diamond lattice correspond with the oxygen atoms in the crystobalite lattice. In each of these charge distributions are 0.42 electrons. The form of the load distributions is given. 13 illustr, 16 ref, 5 tables.

*A* *F Ucc*

**Diffuse X-ray scattering from irradiated diamond, sapphire, silicon and germanium crystals**

S. T. Konobeevskii, F. P. Butra. *Reactor Science—J Nuclear Energy Pt I* 1959 Vol 11 (1) p 48 (Nov); Transl from *Soviet J Atomic Energy* 1958 Vol 5 p 572 (In English, original in Russian)

Letter to the editor.

Experiments are described from which it follows that the intensity of the diffuse scattering resulting from irradiation is not directly related to the changes in unit cell size, and the diffuse scattering may remain strong after an annealing treatment which is sufficient for a considerable recovery in cell size. The diffuse scattering must therefore mainly be related to slight lattice defects, *eg* vacancies and dislocations, while the changes in unit cell size are caused by large distortions of the lattice, *ie* interstitial atoms which are first to anneal out in heating. Thus, in diamond, where bonding is very strong, interstitial atoms and vacancies are retained after irradiation. In silicon irradiated at 80° C only vacancies can accumulate; while in germanium, as in the majority of other metals, most of the single defects anneal out during irradiation. 3 illustr, 5 ref.

*D* *Bbd Qv Uklb/Bfr Qv Uklb/Bkc Qv Uklb/F Hse Uklb*

**The influence of some reagents on the condition of a diamond surface during extraction by physico-chemical methods of preparation.** Der Einfluss einiger Reagentzien auf den Zustand der Diamantoberflaeche bei der Extraktion nach physikalisch-chemischen Aufbereitungsmethoden

V. S. Alekseev, I. N. Plaksin. *Nauk Dokl Vyss Skoly, Gornoe Delo* 1958 (4) pp 219-222 ; abstr *Glueckauf* 1959 Vol 95 (21) p 1339 (Oct 10) (Original in Russian, abstr in German)

According to experiments described in detail, kresyldithiophosphate, known in the USSR as aeroflot, in a concentration of 0.01 mg/l renders the surface of diamonds considerably stronger as a water-repellent than do oleinsaeure and natrium oleat in a concentration of 1 mg/l. *A* *F Gz Sb*

**Diamonds in meteorites**

Anon. *Diamond News* 1959 Vol 23 (3) p 16 (Dec)

Mr Edward Anders, assistant professor of chemistry at the University of Chicago, putting forward a theory of meteorites at the university's autumn conference with industrial sponsors, said that the theoretical limit of 300 miles in diameter of the parent asteroid had raised questions about the origin of the diamonds that are occasionally found in meteorites. The only known conditions under which diamonds are formed on earth are enormous pressures and temperatures. Since small asteroids could not produce these conditions they may be able to make diamonds by some process as yet unknown. Or the asteroids may be the debris of a larger planet. *X* *Eg F*

**Several firms now making diamonds**

Anon. *Diamond News* 1959 Vol 23 (3) p 11 (Dec)

Several companies in Europe and the United States are now able to make synthetic diamonds and one of them, the Asea, Allmanna Svenska Elektriska AB, Vasteras, Sweden, which produced its first synthetic diamonds in February, 1953, is reported to be developing equipment to enable production on a commercial basis. At Philips, Eindhoven, Netherlands, experiments are taking place with high pressures and high temperatures. These new techniques are stated to offer many possibilities of converting materials, of which the production of synthetic diamonds is said to be only one of the many aspects. The Asscher Diamant MY of Amsterdam, is using a high explosive system by which carbon is transformed into very hard material. The attempts are still in the trial stages. Meanwhile, the Norton International Inc, Worcester, Mass, is said to be able to produce synthetic diamonds which are claimed in most cases to be of higher quality for grinding purposes than natural diamonds.
*D* *Fh Ha*

**De Beers succeed in making synthetic diamonds**

Anon. *Gemmologist* 1959 Vol 28 (341) pp 221-225 (Dec)

A survey of diamond synthesis methods.
*D* *Fh.13*

**Diamond-making process revealed**

Anon. *Mech Engng, NY* 1960 Vol 82 (1) p 53 (Jan)

Refers to GEC's disclosure of diamond synthesis methods. 2 illustr. *D* *Fh Ha*

**De Beers are making synthetic diamonds !** De Beers macht synthetische Diamanten !

Anon. *Gold u Silber* 1960 Vol 13 (1) p 25 (Jan) (In German)
*K* *Fh Qc.361*

**A new imitation diamond ?** Eine neue Diamantimitation ?

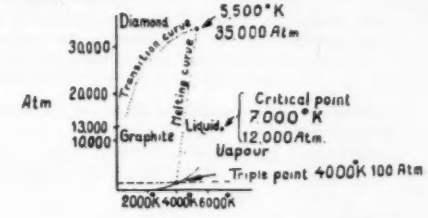
Anon. *Gold u Silber* 1960 Vol 13 (1) p 26 (Jan) (In German)

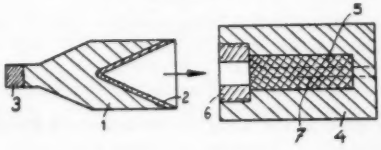
The article discusses the new artificial diamond substance, ' Diamondite ', being produced in America.
*K* *Fh.342*

**BP 822,363** (Aug 24, 1956) **J. Van Tilbury, NV Asscher's Diamantnijverheid**

**Process for the manufacture of diamond from graphite**

The only successful production of artificial diamonds known up to now has been by the process developed by the General Electric Co in USA. The diamonds have a size of 0.1 ct and the process requires heavy and costly equipment as a static pressure of approximately 140,000 atm has to be produced at 2,700° centigrade. Instead of applying high static pressures the new process operates with dynamic pressure. A target containing graphite is subjected to a pressure reaching up to a few millions of atmospheres, at temperatures of thousands of degrees by the explosion of an explosive which may have the form of a shaped charge as represented in Fig 2 by 1, provided with a liner 2



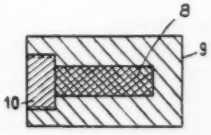




*Fig 1 (top). The phase-diagram of carbon.*
*Fig 2 (centre). Cross section of a shaped charge 1 aimed at a target 5.*
*Fig 3. Cross section of another form of target. BP 822,363.*

and a booster 3. The jet resulting from the detonation is directed at high velocity (approximately 50 km/second) onto the graphite containing target 5 held in housing 4 by holed nut 6. The collision produces hole 7 by plastic flow of the target material in radial direction. To make crystallization easier, splinters of diamond or structurally related material, can be embedded in the target material which may have been pre-heated or pre-compressed. Fig 1 represents the phase-diagram of carbon. Fig 3 shows a cross-section of a target 8 fixed in housing 9 by means of plug 10. (10 claims, 5 illustr). *J* *Fh Ha.545*

# PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF HARD MATERIALS

**Quantitative relations in generalized Fourier projections of the electron density of crystals**

B. K. Vainshtein. *Soviet Phys, Crystallogr* 1959 Vol 3 (5) pp 531-543 (Dec) (Original in Russian)

The shape of peaks on conventional (generalized) Fourier projections of the electron density of crystals is discussed. Formulae are derived for the calculation of the heights of these peaks, for the normilazation of Fourier series of nonzero reciprocal-lattice planes, for the evaluation of the accuracy of values of electron density and also the horizontal and vertical coordinates of atoms on these projections. Modulus projections are also considered. 7 illustr, 16 ref, 1 table.

*X* *Bd Ubb*

**Surfaces of refraction and absorption of absorbing crystals**

A. M. Goncharenko, F. I. Fedorov. *Soviet Phys, Crystallogr* 1959 Vol 3 (5) pp 592-597 (Dec) (Original in Russian)

Cross sections in the principal planes of the surfaces of the refractive indices and absorption coefficients of crystals of the orthorombic and middle systems are examined. A simple universal graphic method is given for determining the extremal directions of the refractive indices and absorption coefficients in these sections. 2 illustr, 4 ref. *X* *Bdz Ukk/Bdz Ukz*

**The measurement of internal stresses in crystals of synthetic corundum**

V. L. Indenbom, G. E. Tomilovskii. *Soviet Phys, Crystallogr* 1959 Vol 3 (5) pp 599-605 (Dec) (Original in Russian)

6 illustr, 16 ref. *D* *Bbcb Unq V*

**A model for the color and luminescence centers in quartz**

E. N. Batrak. *Soviet Phys, Crystallogr* 1959 Vol 3 (5) pp 633-634 (Dec) (Original in Russian)

3 illustr, 5 ref. *D* *Bcb Ukb/Bcb Ukz*

**Sources of error in the X-ray determination of quartz**

G. W. Brindley, S. Udagawa. *J Amer ceram Soc* 1959 Vol 42 (12) pp 643-644 (Dec)

1 illustr, 5 ref. *D* *Bcb Vjf.21*

**Control in a crystal-pulling furnace**

Anon. *Instrum Pract* 1960 Vol 14 (1) p 53 (Jan)

The Services Electronics Research Laboratory have developed a crystal-pulling furnace. The commercial version is manufactured by Nash & Thompson Ltd, and the initial model was recently demonstrated at the firm's Tolworth works. The method adopted is the well-known one of lowering a seed crystal into a melt in a crucible within a furnace and then gradually withdrawing the seed through a temperature gradient. The furnace and operation are described. 1 illustr.

*D* *Bd Ct*

**Theory of the influence of optical activity on Raman effect in crystals.** Theorie des Einflusses der optischen Aktivitaet auf den Raman-Effekt in Kristallen

V. Chandrasekharan. *Z Phys* 1959 Vol 154 (1) pp 43-50 ; *Glastech Ber* 1960 Vol 33 (1) p 25 (Jan) (In German)

*K* *Bd Uk*

**LITERATURE REQUESTS**

**Please quote the page number of the journal which contains the original reference, and the author and title of the article, in all cases.**

**Infrared absorption of silicon of high resistivity containing radiation defects**

V. S. Vavilov, A. F. Plotnikov, G. V. Zakhvatkin. *Soviet Phys, Solid State* 1959 Vol 1 (6) pp 894-896 (Dec) (Original in Russian)

1 illustr, 5 ref. *D* *Bkc Ukj*

**Redox processes in germanium electrodes.** Redoxvorgaenge an Germanium Elektroden

F. Beck, H. Gerischer. *Z Elektrochem* 1959 Vol 63 (8) pp 943-950 (Nov) (In German)

10 illustr, 15 ref, 1 table. *A* *Ptc Sbz*

**Single crystals of very pure silicon or germanium.** Einkristalle aus hochreinem Silicium oder Germanium

Anon. *Angew Chem* 1959 Vol 71 (24) insert p 407 (Dec 21) (In German)

Crystals are grown by a process in which cleaned, volatile hydrides of these elements (*eg* $SiH_4$) are burned in an oxidizing gas (*eg* chloride).

*A* *Bfr Ubz/Bhc Ubz*

**Properties of crystals with hypothetical close-packed structures**

A. V. Stepanov. *Soviet Phys, Solid State* 1959 Vol 1 (4) pp 610-612 (Apr) (Original in Russian)

This article gives an approximate estimate of some properties, thermal and mechanical, of hypothetical close-packed, cubic face-centred atomic structures (with the coordination number 12) of certain substances including carbon. 1 table, 4 ref.

*D* *Bd Ubb*

**The specific heats of a number of semiconductors**

P. V. Gul'tyaev, A. V. Petrov. *Soviet Phys, Solid State* 1959 Vol 1 (3) pp 330-334 (Mar) (Original in Russian)

Results of studies on germanium and silicon are given. 9 tables, 10 ref. *D* *Bde Udz*

**Regarding the plasticity of certain alloys at high pressures**

Yu. N. Ryabinin, L. D. Livshits, L. F. Vereshchagin. *Soviet Phys, Solid State* 1959 Vol 1 (3) pp 429-433 (Mar) (Original in Russian)

Results are described of experiments on stretching and fracturing of specimens of Duralumin, iron and two grades of steel immersed in a liquid at high hydrostatic pressures. A relation was found between the true deformation and the pressure for these materials. A change in the microstructure of steel, which took place at large plastic deformations, was detected. 3 illustr, 4 ref. *X* *Bfx Und*

**The mechanical properties of solids, particularly metals, at temperatures of 4.2° K and below — II. The fracture of coarse crystal aluminium (99.996%) and of the high strength aluminium alloy B-95**

O. V. Klyavin, A. V. Stepanov. *Soviet Phys, Solid State* 1959 Vol 1 (6) pp 873-877 (Dec) (Original in Russian)

5 illustr, 14 ref. *D* *Bf Ud*

**X-ray measurement of thermal expansion perpendicular to the layer planes of artificial and natural graphites**

E. G. Steward, B. P. Cook (GEC, Wembley). *Nature, Lond* 1960 Vol 185 (4706) pp 78-80 (Jan 9)

1 illustr, 6 ref. *D* *Bhb Ub/Bhbb Ub*

**Summary of some properties of yttrium iron garnet and study of dislocations observed in an yttrium iron garnet crystal**

T. H. Ramsey jun. *J Amer ceram Soc* 1959 Vol 42 (12) pp 645-646 (Dec)

1 illustr, 1 table. *D* *Bbh Ub*

**Identifying precious stones (XII).** Wir bestimmen Edelsteine (XII)

Anon. *Gold u Silber* 1960 Vol 13 (1) pp 27-28 (Jan) (In German)

The article discusses the optical behaviour of bi-axial crystals and the practical application of double refraction in identifying precious stones. 2 illustr, 3 tables.

*K* *Bb Ccb*

**The determination of the coordinates of atoms in the unit cell of a crystal by means of the F²-series**

A. I. Kitaigorodskii. *Zh eksp i teor fiziki* 1951 Vol 21 (6) pp 717-720; *LLU Transl Bull* 1960 Vol 2 (1) p 48 (Jan) (Original in Russian)

*D* *Ub*

**On the possibility of detecting a centre of symmetry of a crystal by X-ray analysis**

A. I. Kitaigorodskii. *Zh fiz khimii* 1951 Vol 25 pp 127-128; *LLU Transl Bull* 1960 Vol 2 (1) p 48 (Jan) (Original in Russian)

*D* *Bd Ubz Vuz*

**Growth of single crystals of incongruently melting yttrium iron garnet by flame fusion process**

R. G. Rudness, R. W. Kebler. *J Amer ceram Soc* 1960 Vol 43 (1) pp 17-22 (Jan)

8 illustr, 8 ref. *D* *Bbh Ct*

**Synthetic sapphires for electronic components**

R. D. Olt (Union Carbide Corp, NY). *Electronics* 1959 Vol 32 (49) pp 110-111 (Dec 4)

Tables show electronic uses of sapphire and properties of synthetic sapphire. 1 illustr, 3 tables, 11 ref.

*D* *Bbd Ue/Bbdb Ue*

**An unusual star-beryl**

W. F. Eppler. *J Gemm* 1960 Vol 7 (5) pp 183-191 (Jan)

An article on studies of an unusual star-beryl consisting of transparent beryl, which contains a multitude of crystal inclusions. Because of this, the stone appears to be translucent to nearly opaque. The inclusions are described. 15 illustr, 5 ref.

*D* *Bbj.21*

**More rubies from the laboratory**

G. Andrews. *J Gemm* 1960 Vol 7 (5) p 182 (Jan)

C. F. Chatham has announced the making of ruby in his laboratory. Curved growth lines are obviously absent and the new product contains various types of inclusions similar to those which occur in the natural stone. The stones fluoresce brightly but do not phosphoresce. First evidence indicates that gemmologists and jewellers will find difficulties in distinguishing these stones from natural ruby.

*D* *Bbe*Bbeb*

**Particle integration rate in crystal growth**

R. Cartier, D. Pindzola, P. F. Bruins. *Industr Engng Chem* 1959 Vol 51 p 1409; *Insdoc List* 1959 Vol 6 (24) col 1889 (Dec 16)

*D* *Ubz*

**Etch patterns on highly deformed copper and alpha-brass.** Aetzfiguren in stark verformtem Kupfer und Alpha-Messing

G. Bassi. *Z Metallk* 1959 Vol 50 (12) pp 716-720 (Dec) (In German)

The article describes tests carried out on deformed copper and α-brass. Diamond was used in the rough polishing of the surfaces to be tested. 6 illustr, 7 ref.

*K* *Bfa Chm Nv*

**Nickel alloys and other metals—comparative physical and mechanical properties**

Anon. *Canad Mach, Annual Directory (1960)* 1959 Vol 70 (12) pp 180-181 (Dec)

Information in the form of data sheets.

*D* *Bf Ue/Bf Un*

**Aluminium—its electromechanical function in design**

Anon. *Elect Mfg* 1959 Vol 64 (6) pp 114-123, 186, 188 (Dec)

Includes a section on machinability of aluminium and its alloys. In general, the casting alloys containing principally copper, magnesium, or zinc can be machined rapidly and satisfactorily. Tools may have smaller rake angles than for most of the other alloys; chips are small and are unlikely to build up on the cutting edge. Casting alloys with silicon as the predominant alloying element machine best if speeds and cuts are reduced and rake angles increased. Those wrought alloys that have been heat treated to improve their mechanical properties usually have good machining characteristics. Alloy 2011 is the most free-machining. 4 illustr, 6 tables.

*D* *Bfg Unp/Bfxc Unp*

**New metals have high strength, corrosion resistance**

Anon. *Commonw Engr* 1959 Vol 47 (3) pp 48-51 (Oct)

Traces development of the applications of titanium, zirconium, beryllium, molybdenum, chromium, and hafnium. Properties and fabrication are described.

*D* *Bf Ungz/Bf Unlz*

**Alloy steel has tensile strength up to 300,000 psi**

Anon. *Design News* 1959 Vol 14 (26) p 5 (Dec 21)

US Steel Corp has developed an ultra-high strength alloy steel that can be forged, machined, and heat-treated to tensile strengths in the 280,000 to 300,000 lb/m² range. Called 'Strux', it has about 7% more strength than SAE Type 4340.

*D* *Bfd Unlb*

**High-grade steel—its importance and technical development.** Edelstahl, seine Bedeutung und sein technischer Fortschritt

F. Rapatz. *Industriekurier* 1960 Vol 13 (13) p 10, 12, 14, 16 (In French and German)

5 illustr, 1 table. *K* *Bfd.21*

**Some new alloy metals**

Anon. *Mech World* 1960 Vol 140 (3486) pp 27-28 (Jan)

Some new alloys are described and the purpose behind their development suggested.

*D* *Bfx.132*

**Materials for environmental extremes**

G. Sideries. *Electronics* 1959 Vol 32 (49) pp 81-96 (Dec 4)

A special report on materials needed for electronic parts which have improved heat resistance, dimensional stability over wide temperature ranges, and uniform electrical properties under all conditions. Suitability of ceramics and quartz for electrical insulation and sapphire and mica for high temperature insulation are among topics covered. Carbides, carbon, nitrides, oxides and aluminium are discussed as potential high temperature materials. 20 illustr, 29 ref, 11 tables.

*D* *Az B Ue*

**REQUESTS FROM AMERICA**

**American readers who wish to order a photostat or reprint of an article abstracted in Industrial Diamond Abstracts are advised to apply directly to the appropriate ournal if this is an American publication.**

**Materials used in precision engineering.** Werkstoffe der Feinwerktechnik

Anon. *Draht* 1960 Vol 11 (1) pp 22-24 (Jan) (In German)

A conference in October, 1959, at Villingen was organized by the VDI Fachgruppe Feinwerktechnik and the Institut fuer Feinwerktechnik und Regelungstechnik der Technischen Hochschule Braunschweig. The general theme of the conference was 'Materials used in precision engineering'. Among the papers given were: 'Machinability of materials for automatic machines', by Meier; 'The requirements of materials for precision engineering', by Prof Franz; and 'Gear wheels made from sintered materials', by Endter.

*K* *B Vwk.231.322*

**Physical metallurgy as applied to metal finishing**

A. Alexander. *Metal Finish J* 1959 Vol 5 (59) pp 411-417

The distinguishing characteristics of metals are described and such subjects as their mechanical properties, the effect of working on structure and properties, and fatigue are discussed. Hardness testing using a diamond pyramid is mentioned.

*D* *Bf Cv Nde/Bf U*

**U.S. mine research programme**

Anon. *Min J* 1959 Vol 253 (6473) p 237 (Sep 11)

The research programme of the US Bureau of Mines on uranium and thorium in the fiscal year 1960 will include studies in the mining and metallurgy or radioactive raw materials, and investigation, appraisal, and use of nuclear techniques in minerals research.

*D* *Bn Cfb.131.342*

**Rare metals for special purposes**

J. P. Denny, L. F. Kendall. *Engng Mater & Design* 1959 Vol 2 (12) pp 624-627 (Dec); *Instrum Abstr* 1960 Vol 15 (1) p 29 (Jan)

Intended to bring designers up to date on some uncommon metals, a review is presented of the potentialities of zirconium, hafnium, vanadium, columbium (niobium), tantalum, chromium, and rhenium.

*X* *Bf U*

**Germanium crystals.** Germanium Kristalle

Anon. *Angew Chem* 1959 Vol 71 (24) (insert) p 407 (Dec 21) (In German)

Crystals are being produced by Westinghouse Laboratories in the form of thin, regular strips, by means of a new process, thus being suitably shaped for use in transistors without mechanical slicing.

*A* *Bfr Ct*

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## DIAMOND, ETC, IN INSTRUMENTS

**Scientific instruments and apparatus**

Anon. *Metal Ind, Lond* 1960 Vol 96 (3) pp 51-52 (Jan 15)

A review of exhibits at the Physical Society exhibition of scientific instruments and apparatus.

*D* *V.27*

**The Physical Society Exhibition**

Anon. *Machinery, Lond* 1960 Vol 96 (2463) pp 215-219, 227 (Jan 27)

Some moiré fringe applications are discussed. Other items include new linear measuring equipment, a surface-texture comparator, and a photoelectric micrometer microscope. 4 illustr. *D* *W.27*

**New device for obtaining X-ray diffraction patterns from substances exposed to high pressure**

J. C. Jamieson, A. W. Lawson, N. D. Nachtrieb. *Rev sci Instrum* 1959 Vol 30 (11) pp 1016-1019 (Nov)

A device is described for obtaining powder diffraction patterns of thin sheets pressed between opposing diamond pistons. The pressure, initially applied by a small auxiliary laboratory press, is clamped onto the sample by a lock-nut. The whole unit is designed to replace the sample mount of a standard X-ray diffraction unit. The device used earlier in this laboratory was a drilled 3 ct diamond pressure vessel in which miniature pistons were inserted. Because of the high background scattering from the diamond to the recording film, patterns could not be obtained for highly absorbing substances. Dilution of the sample was not effective due to the absorption by the diamond. This article describes a more satisfactory technique which avoids the difficulties arising from sample absorption and which gives a better signal to noise ratio. Sample patterns taken on two of the high pressure modifications of bismuth are exhibited. 6 illustr, 14 ref.

*D* *F Uklb*

**Surface testing equipment**

Micrometrical Manufacturing Co. *Industr Diam Rev* 1959 Vol 19 (229) p 238 (Dec)

Both linear and rotary heads are available on Micrometrical Manufacturing Co's surface testing equipment, the Proficorder. An Amplicorder unit provides amplification of the signal derived from the tracer head, at the same time recording the result permanently. The tracer itself is a diamond stylus of small tip radius, its displacements being translated into electrical terms by a differential transformer transducer. The maximum dimension that can be tested by the rotary model is 8 in. on inside or outside diameters; the minimum is 1/32 in. for outside and ¼ in. for inside diameters. An illustration shows how the instrument may be set up to record either major deviations (waviness), minor deviations (roughness), or both simultaneously. 3 illustr.

*D* *Cse Nd*

**Application of electron microscopy**

J. Jazek. *Metal Treatm* 1960 Vol 27 (172) pp 19-27 (Jan)

A method of preparing specimens which allows the disclosure of precipitates by means of a simple extraction replica is described, and examples are given of its use. 12 illustr, 3 ref.

*D* *Wjg*

**The development of the compound microscope in the Zeiss Works**

H. Gerlach. *Jena Review* 1959 Vol 4 (6) pp 184-187

7 illustr.

*D* *Wcm.132.322*

**MP 1/MP 2—Two new Swiss profile projectors.** MP 1/MP 2—Zwei neue Schweizer Profilprojektorentypen

G. Troxler & Co, Steinentorstr 25, Basel. *Feinw Tech* 1959 Vol 63 (12) p 461 (Dec) (In German)

The MP 1 is an optical instrument with easily interchangeable objectives, a guaranteed magnification of $^{1}/_{100}$ of the nominal value, and simple switching from diascopy to episcopy. It is used where a measuring field of 13 mm diameter and accuracy of ±0.005 is adequate. The MP 2 is a larger table projector with magnification of 10×, 20×, and 50×. Measuring accuracy down to 0.002 mm is guaranteed. A revolving set-up mechanism and a colour filter are additional advantages. 1 illustr.

*A* *Wct*

**A simple stereoscopic microscope**

Wire Products & Machine Design, Kingsbury Works, Bridge Rd, Haywards Heath, Sussex. *Industr Diam Rev* 1959 Vol 19 (227) p 199 (Oct)

The 'Sterimag' could be described as a production line streoscopic microscope; it gives two scales of magnification (×10 and ×20), with completely separate optical systems for each eyepiece. The design of the stand allows adjustment to the most comfortable working position, while the whole microscope head can be swung aside if desired. Magnified examination of many small objects or detailed investigation of large areas is thus made easier. 1 illustr.

*D* *Wcmm*

**Inspection of diamond gramophone styli**

Sinex Engineering Co Ltd, Central Way, North Feltham, Middx. *Industr Diam Rev* 1959 Vol 19 (229) p 239 (Dec)

See also *Mach Lloyd* 1959 Vol 13 (22A) pp 56-57 (Oct 31); abstr *Industr Diam Abstr* 1959 Vol 16 p A229 (Dec). *D* *Ne Qd*

**The spectroscope.** Das Spektroskop

B. W. Anderson. *Dtsch Goldschmiede Ztg* 1960 Vol 58 (1) p 11 (Jan) (In German)

*K* *Wcp*

**Transmission electron microscopy studies of the mechanism of plastic deformation**

A. Berghezan, A. Fourdeux (European Research Associates SA, Brussels). *J appl Phys* 1959 Vol 30 (12) pp 1913-1922

24 illustr, 44 ref. *D* *Unkc.21:Vgj*

**An X-ray camera for the study of crystals over the range −175° to +300° C**

N. N. Zhuravlev, A. A. Katsnel'son. *Soviet Phys, Crystallogr* 1959 Vol 3 (5) pp 639-641 (Dec) (In English, original in Russian)

3 illustr, 3 ref, 1 table.

*D* *Bd.21:Wcfd*

**The technological problems of automation in machine tool manufacture, Part II.** Die Technik der Automatisierung im Maschinenbau—II. Teil

H. Loewinger, G. Schmidt, H. Krauss. *Fertigungstechnik u Betrieb* 1959 Vol 9 (12) pp 730-735 (Dec) (In German)

Mentions that diamond indenters may be used in the Rockwell hardness testing process for automatic testing of the properties of materials. 10 illustr, 2 ref.

*K* *Pr.25:.133*

**Survey of various special tests used to determine elastic, plastic, and rupture properties of metals at elevated temperatures**

F. Garofalo. *ASME Prep* 1959 (59-A-112) 14 pp; *Index aero* 1959 Vol 15 (12) p 51 (Dec)

*D* *Bf Vb:U.1312*

**Surface roughness tester provides magnified chart record**

G. E. Marbaix, Devonshire Hse, Vicarage Crescent, London SW1. *Industr Equipm News* 1959 Vol 8 (20) p 103 (Dec)

1 illustr. *A* *Wgf*

**LITERATURE REQUESTS**
**When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.**

**Summarized proceedings of a conference on electron microscopy—Exeter, July 1959**

Electron Microscopy Group, Institute of Physics. *Brit J appl Phys* 1960 Vol 11 (1) pp 22-32 (Jan)

12 illustr, 32 ref. *D* *Vjg.231*

**Design and performance of a rapid-scanning X-ray diffractometer**

A. Skertchly. *J sci Instrum* 1960 Vol 37 (1) pp 6-14 (Jan)

12 illustr, 9 ref, 3 tables. *D* *Wce*

**Pyramid point phone needle produces 'higher-fi'**

Fidelitone Inc, Chicago, Ill. *Design News* 1959 Vol 14 (23) p 8 (Nov 9)

Conventional round-ended needles rise as the included angle of the groove becomes narrower, thus distorting the sound. Pyramid shaped points with four sides have been developed which distribute the tone arm weight over a large groove area, reducing both sound distortion and wear on record and needle. 1 illustr.

*A* *Tde*

**An instrument for measuring cutting forces during turning**

B. I. Mukhin. *Machines & Tooling* 1959 Vol 30 (9) pp 25-26 (Original in Russian)

5 illustr. *D* *Ceqb Uqg W*

**An instrument for measuring drilling cutting forces**

R. A. Shmidt, B. I. Mukhin. *Machines & Tooling* 1959 Vol 30 (9) pp 26-27 (Original in Russian)

3 illustr. *D* *Cfb Uqg W*

**BP 821,130** **A. Roesch, Ferd Wagner**

(Dec 11,1956—conv date, Germany)

**Improved bearing arrangement**

(11 claims, 6 illustr). *D* *Psn 545*

## HARDNESS AND WEAR TESTING

**The technique of hardness testing and its use as a test in the production of copper and copper alloys in the form of sheet and strip [Pt II]**

V. L. James. *Sheet Metal Ind* 1959 Vol 36 (392) pp 809-819 (Nov)

The preparation of specimens consists in cleaning the surface with a medium grade grit paper, grit 320 being found to give a clean surface, speed in preparation, and a clear impression of diamond or small ball indenter. The thickness of the specimen influences the hardness value in accordance with the load applied. Stacking thin specimens to form a pack is not recommended. The specimen should be set up so as to avoid tilting or elastic swing-back and the table should be absolutely free from dirt or grit. Three different types of mount are in use and have been examined for their effect on results due to tilt, *etc.* A certain amount of deformation arises, *eg* the 136° diamond superimposes about 8% additional strain. Surface roughness of indenter also effects results, as does the width of the specimen. The exact shape of the deformed area is discussed, and the effect on this of the orientation of the diamond pyramid is examined. 10 illustr, 6 tables. (To be cont).

*A* *Bfh Cvd Nd*

**A film for recording the reactions in the diamond wheel structure**

K. E. Schwartz. *Industr Anzeig* 1958 Vol 80 (92) pp 1391-1395 (Nov 18); *Industr Diam Rev* 1959 Vol 19 (227) pp 195-198 (Oct); (228) pp 214-219 (Nov); abstr *Industr Diam Abstr* 1959 Vol 16 p A13 (Jan)

An apparatus was developed and used with which it was possible to record continuously the processes at a particular point in the grinding layer of a grinding wheel. The equipment consisted only of a sub-standard film camera, a stroboscopic light, suitable synchronization set-up, and optical compensation. It was possible to record accurately the occurrence of wear in the grinding wheel with regard to its progress, relating the amount of wear to time, and to draw conclusions concerning the chip process in grinding. The equipment is applied extensively to the field of chip research in grinding. 11 illustr, 4 ref.

*D* *Nv Ubb.58*

**Hardness tester**

Engineering & Scientific Equipment Ltd, Coronet Hse, 287-289 Old St, London EC 1. *Industr Equipm News* 1960 Vol 9 (2) p 81 (Mid-Jan)

Incorporating the Rockwell principle of testing hardness, Model BDL 4 will test up to 600 pieces/hr, can be controlled by a single lever, and has an automatic device for zero setting. Model BDL 4LT is basically similar, but can be fitted with an automatic parts sorter. Tests are done by a sphero-conical diamond or by a 1/16 in. or ¼ in. ball under 60, 100 or 150 kg load. *D* *Wgh*

**Surface hardness of sheet glass untreated and treated with vapours of metal chlorides**

G. Koranyi. *J Soc Glass Tech* 1959 Vol 43 (215) pp 438T-450T (Dec)

Diamond pyramids, cones and spherical surfaces were used in indentation hardness tests on glass surfaces. 11 illustr, 11 ref, 3 tables. *D* *Bm Cvd Nd*

**The practical realization of the HV and HR scales**

R. S. Marriner (National Physical Lab). *Industr Diam Rev* 1959 Vol 19 (227) pp 186-190, 192, 194 (Oct)

5 illustr, 2 tables, 4 ref.

See *Metallurgia* 1959 Vol 60 (358) pp 63-68 (Aug); abstr *Industr Diam Abstr* 1959 Vol 16 p A205 (Nov).

*D* *Cvd Wghc*

**Approximate comparison of hardness scales**

Anon. *Mat des Engng* 1959 Vol 50 (3) p 131 (Sep); *Instrum Abstr* 1960 Vol 15 (1) p 35 (Jan)

A nomograph is presented for the comparison of the Brinell, Rockwell and Mohs scales.

*X* *Unhbb.515*Unhcb.513*Unhcd.513*

**Note on the scratching of diamond**

T. H. Wentorf jun. *J appl Phys* 1959 Vol 30 p 1765; *Insdoc List* 1959 Vol 6 (24) col 1848 (Dec 16)

*D* *F Hlc*

**Testing tool life of spiral drills by a special sharpening technique with regard to the 'Klemm' drilling method.** Standzeitversuche mit Sonderanschliffen an Spiralbohrern unter Beruecksichtigung der Bohrmethode 'Klemm'

G. Menzel. *Fertigungstechnik u Betrieb* 1959 Vol 9 (12) pp 745-749 (Dec) (In German)

2 illustr, 12 tables. *K* *Pl Uqe*

**Roughness in the end-milling of castings.** Rugosités de fraisage en bout de la fonte

L'Abbé Cayère. *Mach Mod* 1960 Vol 54 (610) pp 41-46 (Jan)

12 illustr. (Concl). *K* *Am Cfj Unf*

**Distinguishing faults by means of recording waves using ultrasonic testing equipment.** Die Fehlererkennbarkeit bei der Ultraschall-Pruefung mittels Plattenwellen

W. Lehfeldt. *Industrieblatt* 1960 Vol 60 (1) pp 1-7 (Jan 25) (In German)

16 illustr, 1 table, 7 ref. *K* *Wgz*

**Questions in the wear of gear wheels**

M. D. Genkin. *Sowjet Buchneuerschein Vorankuendigungsdienst* 1959 (43) p 15 (Original in Russian)

Book, Isd-wo AN SSSR, 1960, 264 pp. Price DM 6.--. [Not in library of Industrial Diamond Information Bureau]. *A* *Pz Unr*

**DAS 1,062,033** (Nov 15, 1954) **C. W. Gehring**

**Method and machine for testing grinding and honing stones.** Verfahren und Maschine zur Pruefung von Schleif- und Honsteinen

This is an abrasion tester in which the stone is reciprocated beneath the specimen pressed against the stone under a certain adjustable pressure. The wear of specimen and stone is measured separately. Fig 4 shows diagrammatically the essential features of the machine.

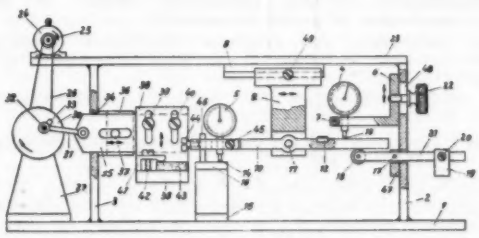


*Fig 4. Diagram of the essential features of the machine. DAS 1,062,033.*

Specimen 46 is clamped in lever 10 pivotable about 11 and adjusted resting on block 16, lever 10 being set in horizontal position using spirit level 12. Slide 9 is then shifted to the left so that specimen 46 contacts vertically adjustable stone 43. By shifting weight 19 on lever 21 the pressure exerted by the specimen on the stone can be adjusted. Then the stone slide arrangement 35, 38 is reciprocated by rotating crank 32 and connecting rod 31 and the wear of specimen and stone determined on dials 4 (total wear) and 5 (wear of specimen). (15 claims, 1 illustr). Ref cited: 5 GP; 1 DBP.

*J* *Pe Ungd.545/Pgk Ungd.545*

## TRUING OF GRINDING WHEELS

**Form dresser**

Glover Manufacturing Co, 423 Park Ave, Meadville, Pa. *Mod Mach Shop* 1960 Vol 32 (8) p 234 (Jan)

The Clearview Radi-Angle form dresser features a powerful specially ground fixed focus lens. With the removable diamond slide, located at the front of the swing arm, radii can be set perfectly with gauge blocks it is claimed. 1 illustr. *D* *Cgj Nj Psfc*

**Manufacture of gear teeth.** Fertigen von Verzahnungen H. G. Wittmann. *Industrieblatt* 1959 Vol 59 (12) pp 668-675 (Dec 25) (In German)

In a general article on the machining of gears, a machine manufactured by Kolb for grinding tooth faces is discussed. There are two versions, the KZ 1 and the KZ 22, which are basically similar, the main variation being that the KZ 22 has two grinding wheels. A different multiple truing device, using six linked diamonds, is usually necessary for both grinding wheels of the KZ 22. 13 illustr. *K* *Ad Ceq*

**Dressing device**

Habit Diamond Tooling Ltd, Lurgan Ave, London W 6. *Industr Equipm News* 1960 Vol 9 (2) pp 28-29 (Mid-Jan)

The Habit Rotatrim is said to true quickly and accurately a diamond impregnated wheel whilst mounted in its working position. It can be used with metal or resin bonded wheels. 1 illustr.
*D* *Nv:Cg Psf*

**Evaluating the productivity of a grinding process operating with a constant radial pressure**

E. N. Korchak. *Russ Engng J* 1959 (4) pp 59-62 (In English, original in Russian)

Exact timing was carried out for external wheel grinding to test the statement that, given a certain machine and component rigidity, the required accuracy and productivity of the operation can be ensured only if the radial speed does not exceed a particular fixed value. A device is described which was developed to give a constant radial force of the component on the wheel during grinding, so making it possible to judge grinding productivity for given working conditions (of wheel, component, and machine) from the amount of metal removed in a given time. Experiments were made during which the wheel was dressed with a TsM-0.5 diamond-metallic dresser; grinding with the same wheel, when it was not dressed, showed a sharp fall in metal removal from 0.016 to 0.009 inch. The experiments proved that wheel blunting under constant grinding conditions, using the device developed, is the same after frequent repetitions; the diameter of the sample or its peripheral speed, either separately or together, considerably effect the linear removal of metal from the sample.

A check was made on the cutting properties of the grinding wheel in relation to the shape of the dressing tool at a speed of 164.1 ft/sec with fine and coarse grade wheels. Two diamond-metallic dressers were used and an abrasive wheel. Cutting capacity of the fine grade wheel remained practically the same for all three types of dressing tool, while the coarse grade wheel also performed adequately with all dressers. Other studies are described. It is concluded that, depending on the value of the radial force, the nature of wheel wear changes, *ie* either blunting of the particles without falling from the wheel occurs (for small radial forces), or a partial or complete self-sharpening (with increase in radial force). 8 illustr, 4 ref.
*D* *Ab Cg Nj Urc.1312/Chc.21*

**DIAMOND TECHNOLOGY**

**First published 1942 as "Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 54s 6d, post free.**

**BP 822,370** (Dec 11, 1956) **J. Houldsworth, A. A. Jones & Shipman Ltd**

**Diamond dressing of grinding wheels**

In a cylindrical grinding machine, *eg* as described in BP 722,444, the tip of the truing diamond mounted in the tailstock should be set so that the continuous wear of the diamond, which requires compensation and which varies according to quality and is estimated to 0.001 in. per 100 passes is taken into account. The final workpiece diameter is dependent on the diamond setting as this diameter is determined by the diameter of the grinding wheel. The "compensated dressing position", as it is called in the specification, is obtained by adjusting the diamond tip against a stop in the shape of a swing arm carrying an abutment pad and operated by fluid pressure projecting and rotating the swing arm under cam control. Fig 5 shows workpiece 40 between centres 37, 38 and grinding wheel 4. Diamond 41 on shaft 2 is urged against abutment 17 of *eg* boron

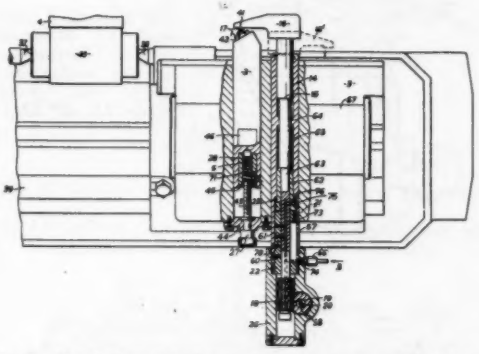


*Fig 5. Workpiece 40 shown between centres 37, 38 and wheel 4. BP 822,370.*

carbide. The abutment is accurately adjusted by a mechanism controlled by cams in connection with the operating cycle of the machine and also automatically swung into and out of operative position. 14 claims, 6 illustr). *J* *Chcl Pr:Ab Cg Nj Psf.545*

**DAS 1,061,650** **Ges der Ludw von Roll'schen Eisenwerke AG**

(Aug 10, 1953—conv date, Switzerland)

**Grinding machine with gearing coupling the feed of the grinding spindle with the feed of the truing device.** Schleifmaschine mit getrieblich gekoppelter Zustellung der Schleifspindel und der Abzieheinrichtung

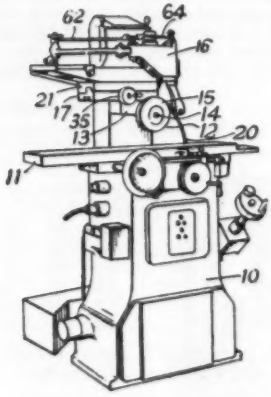
The surface grinding machine operates with a face grinding wheel on a spindle mounted in a rotary sleeve axially adjusted by a worm gear. The truing device is arranged in a second sleeve parallel to the first sleeve and both can be fed simultaneously and uniformly, whereby the movement of the second sleeve is dependent on the adjustment of the stop arresting the feed of both grinding wheel and truing diamond. (8 claims, 2 illustr). Ref cited: 2 GP; 1 DBP; 1 Swiss P; 1 FP; 7 USP; 1 Periodical.
*J* *Chcl Pr:Ab Cg Nj Psf.545*

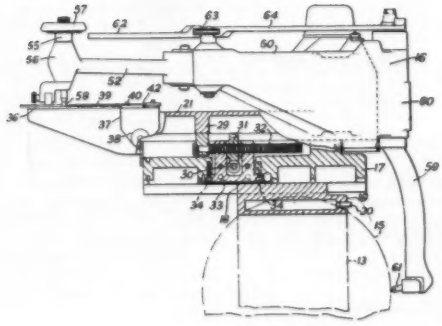
**BP 824,735** (July 23, 1957) **H. S. Hallewell**

**Forming apparatus for profile grinding wheels**

The usual mounting arrangement of a truing device for a surface grinder having a horizontal grinding wheel spindle projecting out over the work table with the truing tool beneath the wheel has certain disadvantages, *eg* only a portion of the table is available for grinding operations and the truing apparatus, a high precision instrument, is exposed to accidental damage if not removed during grinding, which is time consuming and means resetting for each truing operation. In Figs 6, 7 and 8 is shown an arrangement of the truing device above the grinding wheel 15. The movement of the truing diamond tool 61 on arm 59 is controlled by a template 39 on holder 36 and feeler 58 on pantograph mechanism 16 turning about fixed pivot 54. The truing device is mounted on carriage 21 brought into position through worm gear 30, 31 by turning handle 35. Handle 57 moves the feeler 58 along the template. Since tracer and follower members 55 and 59 are arranged on opposite sides of pivot 54, the mechanism operates in reverse so that the profile of the template must therefore be the reverse of the grinding wheel profile enlarged according to the magnification factor of the pantograph. (6 claims, 4 illustr). See also BP 573,877 (panograph mechanism).

*J* *Ab Cgf Nj Psf.545/Ab Cgf Pf Psf.545*



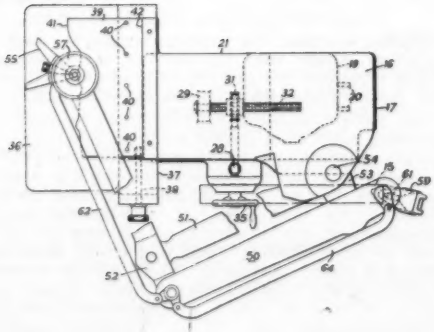


*Fig 6 (top), 7 (centre) and 8. Illustrations of an arrangement of the truing device above the grinding wheel 15. BP 824,735.*

**USP 2,897,810** (Dec 17, 1956) **F. M. D'Amato**

**Wheel dressing tool**

As seen in Fig 9, diamonds for rough cutting are arranged in a cluster 14 on one end of a C-shaped holder, with a diamond impregnated portion 16 for finishing at the other end. The tandem action takes a considerable amount of clogged surface off the wheel and then gives a smooth dressing. For hard wheels, it is advantageous to provide both ends with diamond impregnated portions which can actually compact the surface slightly to produce a very fine finish. The tool is set against the stationary wheel with screw 32 loosened slightly to enable holder 11 to swivel into position, whereupon screw 32 is tightened. No further adjustment is required. (6 claims, 3 illustr). Ref cited : 5 USP ; 2 GP ; 1 Italian P ; 1 BP.

*J* *Ab Cg Nj.545*

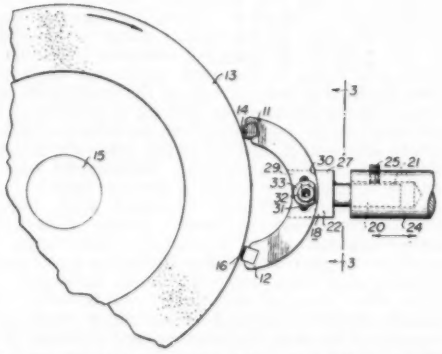



*Fig 9. Diamonds for rough cutting shown in a cluster 14, with diamond impregnated portion 16 for finishing at the other end of the holder. USP 2,897,810.*

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**USP 2,898,708** (Dec 3, 1956) **R. R. Carlton, P. E. Mortensen, Omark Ind Inc**

**Automatic cutter grinder**

The grinder is intended for the hollow grinding of saw chain teeth before their assembly in a saw chain. The teeth are fed and clamped in a predetermined position one by one to be engaged by the grinding wheel. The wheel is trued and re-set accurately so that the teeth remain within the desired tolerance. The truing mechanism is illustrated in Figs 10, 11 and 12.

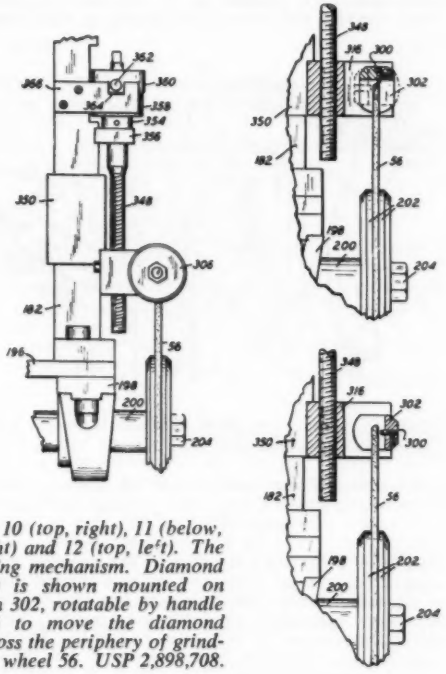


*Fig 10 (top, right), 11 (below, right) and 12 (top, left). The truing mechanism. Diamond 300 is shown mounted on arm 302, rotatable by handle 306 to move the diamond across the periphery of grinding wheel 56. USP 2,898,708.*

Diamond 300 is mounted rotatably on arm 302 for adjustment vertically and laterally of the grinding wheel 56. Arm 302 can be rotated by handle 306 to move the diamond across the periphery of the wheel. Lateral adjustment of arm 302 is also possible. Vertical adjustment of support 316 is effected by spindle 348 and a ratchet mechanism so as to move support 316 by increments of 0.001 inch. (14 claims, 29 illustr). Ref cited : 7 USP ; 2 GP ; 1 FP.

*J* *Al Chc Pr Psf.545*

**USP 2,900,974** (Mar 28, 1958) **O. E. Hill, Norton Co**

**Grinding machine-truing apparatus**

The truing tool or tools are mounted on angularly arranged slides supported by a longitudinally movable slide, so that the thrust of followers on their forming bars serves to impact transverse independent movements to the truing tools for truing wheel profiles with vertical or other irregular shapes. The forming bars are longitudinally adjustable to ease adjustment and compensation for tool wear. Fig 13 is a front elevation

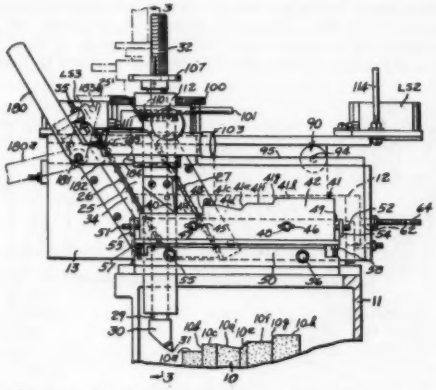
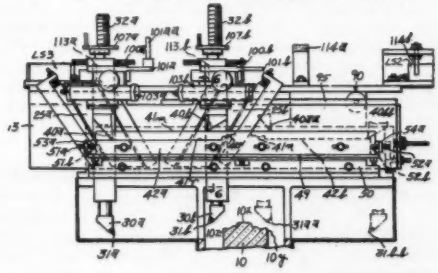


*Fig 13 (above). Front elevation of a truing apparatus.*

*Fig 14 (below). An arrangement of the apparatus with two diamonds 31a and 31b. USP 2,900,974.*



of a truing apparatus with truing diamond 31, follower 40 and forming bar 42. Slide 25 is supported longitudinally on slide 13. Follower 40 is kept in engagement with forming bar 42 by the weight of slide 25. An arrangement with two diamonds 31a and 31b is shown in Fig 14. The corresponding forming bars are 42a and 42b. Slides 25a and 25b are both supported by slide 13. The apparatus may be manually controlled or arranged for a continuous wheel truing cycle with hydraulic operation. (10 claims, 8 illustr). Ref cited : 1 USP.

*J* *Chc Pr:Ab Cgh Psf.545*

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I 252—A new method of determining the average shape of diamond and other particles, by J. F. H. Custers and F. A. Raal ; A counting device for diamonds, by F. A. Raal, (*IDR* 1959).

I 253—Factors affecting the efficiency of resinoid-bonded diamond wheels, by R. G. Weavind (*IDR* 1959).

**USP 2,902,024** (Jan 17, 1956) **W. Muench, Walter Muench Inc**

**Device for dressing bevels on grinding wheels**

A swingable support carries a slide with the truing diamond tool so that any bevel may be produced on the grinding wheel by fixing the support at the desired angle and then sliding the diamond tool by hand across the wheel edge. The slide is mounted on a saddle which is detachable from the swingable support so that this support may carry a truing tool directly. By swinging the support about its pivots, a concave or a convex radius may be trued in the wheel, dependent on the position of the diamond point in relation to the swinging axis, *ie* above or below the axis. Fig 15 is a front elevation of the device, Fig 16 a vertical transverse

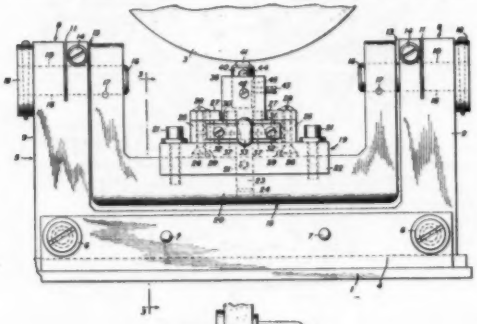

*Fig 15 (above). A front elevation of the device.*

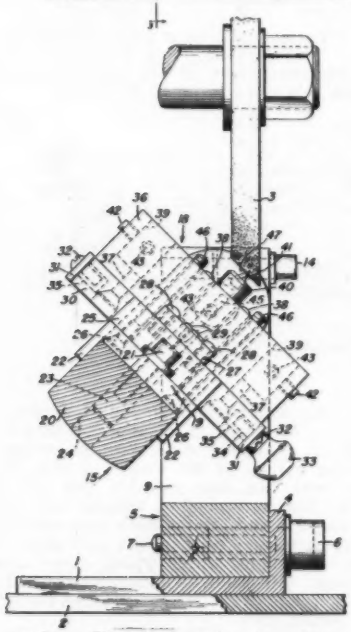

*Fig 16 (left). A vertical transverse section. USP 2,902,024.*

section. The U-shaped swing frame 15 is pivotable about the central axis of trunnions 16. Frame 15 carries saddle 19 with slide 30 on which diamond tool 41 is mounted. 22 is the operating knob. Swing frame 15 is set at the required angle and clamped in position by screw 14. Slide 30 is secured by screws 46 during adjustment of the swing frame. After releasing these screws, the slide is fed by knob 33 across the wheel edge. For radius truing, saddle 19 is removed and diamond tool shank 40 secured in bore 24. (1 claim, 6 illustr). Ref cited : 3 USP.

*J* *Ab Cgh Nj.545*

**USP 2,902,025** (May 25, 1956) **N. Hoglund**

**Grinding wheel dressing apparatus**

The apparatus is designed for truing complex contours on a grinding wheel where one or more radii are needed to an accuracy of 20 millionth of an inch or better, as *eg* for grinding ball race grooves and seal grooves on ball bearings. Fig 18 is an example of such a wheel section to be trued by an apparatus shown in a perspective view in Fig 17. Diamond 19 is mounted in rotatable frame 17′ in yoke 17 arranged on the outer end of tool slide 55. Mounted on yoke 17 is the auxiliary housing 20 with the mechanism for rotating the diamond carrying frame. As the housing moves along racket 11′ parallel to the axis of the grinding wheel, the tool slide remains stationary or is fed radially

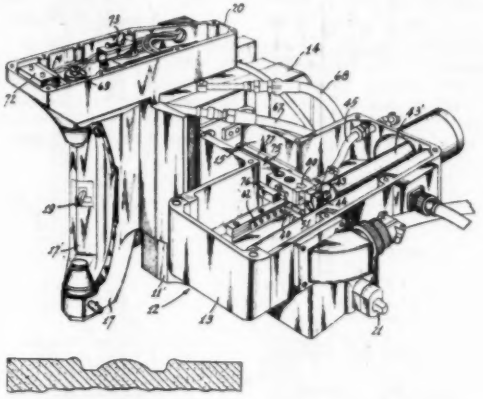

*Fig 17 (above). Perspective view of the truing apparatus. Fig 18 (below, left). Example of a wheel section to be trued. USP 2,902,025.*

towards or away from the wheel. The housing may be stopped between its limits and the tool rotated through an arc to form the radii shown in Fig 18. The movements are controlled by feed and contour cams of which contour cam 51 is marked in Fig 17. The truing operation is automatically effected by fluid pressure under electrical control. (15 claims, 8 illustr). Ref cited : 2 USP.

*J* *Ab Cg Nj.545*

## PRECISION MACHINING OF METALS

**Micro precise drilling is possible with carbide drills**

Atrax Co, Newington, Conn. *Mod Mach Shop* 1960 Vol 32 (8) p 220 (Jan)

Made in wire sizes Nos 61 to 80 with diameters ranging from 0.0135 to 0.0390, Series 1815 solid carbide drills add to the complete line of wire drill sizes from Nos 1 to 80 available from Atrax Co. Solid carbide throughout, this micro-drill is precision ground, standard right hand spiral, has straight shank, machine ground point and is right hand cutting. The 1815 micro-drill is especially recommended for drilling plastics, fibre, fibreglass, and other non-ferrous material. It is also said to be ideally suited for precision drilling in electronic circuit board work. 1 illustr.

*D* *Plz Rg*

**Small carbide drills**

Super Tool Co, Detroit, Mich. *Tooling* 1960 Vol 14 (2) p 73 (Feb)

Straight shank, fast spiral drills, 1¼ in. long, are available in sizes down to 0.0135 in. diameter. Said to be ten times more rigid than HSS drills of the same size, they are claimed, in addition, to have much increased life between re-grinds and to be capable of producing hundreds of holes in plastics, copper, titanium, *etc*, without size variation. 1 illustr.

*D* *Ba Cfb Pl Rh*

**Multi-spindle drilling of small batches**

U. Felssner (Marktoberdorf/Allgaeu). *Progressus* 1959 Vol 40 (6) p 148 (Dec)

2 illustr. *D* *Cfb Pr*

**Enfield's development section saves money**

P. Trippe. *Metalworking Prod* 1960 Vol 104 (4) pp 141-148 (Jan 27)

Includes a section on deep-hole drilling techniques and the use of a vertical deep-hole machine. 11 illustr.

*D* *Cfbz*

**Heliform screwcutting tool**

Edibrac Ltd, Broadheath, Manchester. *Metalworking Prod* 1960 Vol 104 (4) p 169 (Dec)

A carbide-tipped screwcutting tool, designed to reduce setting and grinding times, has a circular tip giving a cutting edge equal to 2½ in. linear length of tip. The Heliform can be supplied with or without a shank and is available in nine grades.

*D* *Ceqbd Pdcb*

**Schiessl universal machine tool**

North London Metals Ltd, 218 Mare St, London E 8. *Machinery, Lond* 1960 Vol 96 (2463) pp 190-191 (Jan 27)

The Austrian-built Schiessl universal machine tool can be used for turning, horizontal and vertical milling, boring and facing. Adjustments for the various operations are described. 2 illustr.

*D* *Ceqb Pr/Cfb Pr/Cfd Pr/Ceqb Pr*

**Some examples of set-ups on Manurhin automatics**

Drummond Asquith Ltd. *Machinery, Lond* 1960 Vol 96 (2463) pp 184-187 (Jan 27)

At one set-up described here, an optical component is machined from aluminium bar in a 23.65 sec cycle, the operations including finish-boring. 7 illustr.

*D* *Bfg Ceq Prs*

**Machine tool for laboratories**

Chicago Apparatus Co, 1735 N Ashland Ave, Chicago, Ill. *Rev sci Instrum* 1959 Vol 30 (12) pp 1148-1149 (Dec); *Mod Mach Shop* 1960 Vol 32 (8) pp 236-237 (Jan)

Unimat is a machine tool comprising ten power tools in a single unit designed for odd jobs in the laboratory. It combines a lathe, drill press, tool and surface grinder, and polisher. Attachments convert it to a vertical milling machine, jig saw, bench saw, threader, or gear indexing and dividing machine. Other attachments are available. Tolerances to 0.0005 in. are said to be possible. *D* *Pr.264*

**A thread-cutting attachment for grinding machines.** Dispositif à fileter sur machine à affûter

H. J. Gerber. *Mach Mod* 1960 Vol 54 (610) p 22 (Jan) (In French)

The article describes an attachment by which grinding machines can be adapted for thread cutting. A truing device can also be attached to the machine table. 3 illustr. *K* *Chc Pr:Ceqbd Psc*

**Turret lathe work in the aircraft industry**

Vickers-Armstrongs (Aircraft) Ltd, Weybridge. *Mach Tool Rev* 1959 Vol 47 (262) pp 122-128 (Nov-Dec)

Describes operations on Herbert lathes, including combination turret lathes which are used, virtually, as general-purpose centre lathes. 11 illustr.

*D* *Ceqb Pr*

**Boring fixture takes dissimilar work**

Ex-Cell-O Corp, Detroit, Mich. *Metalworking Prod* 1960 Vol 104 (1) p 8 (Jan 6)

A style M-A precision boring machine bores several holes in two totally different magnesium castings. After clamping components in the fixture, the table is advanced to the left and one large hole is finish bored, counterbored and faced, while smaller holes are finish bored and chamfered. Hole diameters are held to 0.001 in. tolerance and locations to 0.0005 in. of true position. The table retracts and advances to the right, precision boring and chamfering the opposite side of the casting. Two dowel holes are precision bored in larger, round-bodied casting in a similar manner. 3 illustr.

*D* *Az Cfb Psc*

**The production of Veglia instruments for cars**

Borletti SpA, Milan. *Machinery, Lond* 1960 Vol 96 (2463) pp 176-183 (Jan 27)

A production line for machining a pressure die cast chassis is described. A cored hole in the casting is rough and semi-finish bored on two small drilling machines, and is push-broached to the required diameter and surface finished on a small hydro-pneumatically operated bench press. Faces on projections on each side are then finished square with the bore axis on a special unit in which the casting is held in contact with a rotating file disk by an air cylinder. Next, the end of the bore is finish faced in relation to these filed surfaces, and chamfering and turning operations are carried out on two more small drilling machines. Four holes are tapped on an Italian automatic-cycle, indexing table machine, a thread is then cut and a groove plunge-formed on an automatic high-speed thread-chasing lathe. 8 illustr.

*D* *Az Ceq*

**The manufacture of Everest office machines**

Serio SpA, Crema, Italy. *Machinery, Lond* 1960 Vol 96 (2462) pp 120-127 (Jan 20)

This second article covers the machining of segments from cast meehanite iron disks in two series of operations on a Tarex automatic. Operations on type bars, including piercing, slotting, and shaving are described. 9 illustr.

*D* *Az Bfca Ceq Prs*

**Tools for copying lathes**

B. Almen. *Machinery, Lond* 1960 Vol 96 (2462) pp 135-141 (Jan 20)

Copy turning tools are of four main types : brazed tip, horizontal insert, vertical insert, and throwaway tip. All are discussed and costs compared. In the case of chipbreakers for vertical inserts, it is important to provide a negative land at the cutting edge and to round off the latter with a diamond hone to form a small radius which may be increased from the tip towards the rear. 12 illustr.

*D* *Ceqbz Pr:Pd*

**Single machine handles 14 product variables**

Anon. *Canad Mach* 1960 Vol 71 (1) p 81 (Jan)

Six operations are done on each carburettor shaft in a special Bodine machine which handles 14 variations of hole spacing, size, and location of pads. Changes are quickly made. 1 illustr. *D* *Cfd Pr*

**Applying the Milwaukee-Matic**

Kearney & Trecker Corp. *Metalworking Prod* 1960 Vol 104 (2) pp 49-54 (Jan 13)

Numerically controlled machines with automatic tool changing magazines are cutting costs on small batch production: *eg* a gearbox housing was spot-drilled, drilled, reamed and tapped with twelve tools in a test set-up. Details are given of the application of the Milwaukee-Matic on batch sizes from 10 to 150 components. Cost is compared with conventional methods previously used. 10 illustr, 2 tables.

*D* *Ad Ceq Prs Wpz*

**A complement to the lathe: the 'Filematic'.** Un complément du tour parallèle: le 'Filematic'

Anon. *Mach Mod* 1960 Vol 54 (610) p 40 (Jan) (In French)

This high speed thread-cutting machine, to be used for work where the maximum length reaches 50 mm and the maximum cutting depth 4 mm, can be adapted to the lathe without any modification. It is claimed to combine better concentricity with higher productivity. 1 illustr. *K* *Ceqbd Pr*

**Cutting fluid selection and special cases**

C. J. Taylor, B. V. Harris. *Sci Lubric* 1959 Vol 11 (11) pp 43-44, 46-51 (Nov)

Four main classifications of cutting tool material are considered: carbon tool steels (including alloyed types); high speed steels; non-ferrous cast metals (*eg* stellite); sintered carbides, diamonds, and ceramics. The fluid chosen will depend on the type of machining process required as well as the material being machined. A list of materials, roughly in order of machinability, and a list of machining operations in order of severity are given. Recommendations are made as to correct or normal tooling for each type of material. Diamond tooling with a low viscosity straight mineral oil is recommended for machining bearing metals. For grinding wheels a lubricant which will prevent smearing of the wheel is necessary. A very finely dispersed translucent soluble oil at a dilution of about 60 : 1 in water is satisfactory, but for form grinding a straight oil is best, as also for honing and super-finishing. Cutting pastes are frequently used to advantage in various applications. 5 illustr.

*A* *N Qz Sk/Pd Qz Sk*

**Concentrated cooling and cleansing liquid**

Anon. *Diamond News* 1959 Vol 23 (3) p 29 (Dec)

A Netherlands firm has produced a metal-working oil with triple effect for use when hard metal, glass, *etc*, are worked with diamond tools. The oil is said to stop particles of the worked material being deposited in the pores of the diamond tool, which thus retains the open structure essential for free and cool cutting. Cooling and lubricating properties prevent thermal stresses and ensuing hairline cracks and so improve surface quality. Moreover boart granules remain sharp and are less likely to break from bonding agents, it is claimed.

*D* *Bf Ceq Sj*

**Fundamentals of cutting tool lubrication**

R. H. Norris, E. J. Lownes. *Sci Lubric* 1959 Vol 11 (11) pp 26-35 (Nov)

17 illustr, 1 ref, 2 tables. *A* *Pd Qr*

**Methods of cutting fluid application**

I. S. Morton. *Sci Lubric* 1959 Vol 11 (11) pp 39-43 (Nov)

7 illustr, 16 ref. *A* *Sjk*

**Water-base cutting fluids**

I. S. Morton. *Sci Lubric* 1959 Vol 11 (11) pp 70-72 (Nov)

3 ref. *A* *Sjk*

**Molybdenum disulphide as an aid to cutting and forming operations**

H. P. Jost. *Sci Lubric* 1959 Vol 11 (11) pp 72-76, 80-81

1 illustr, 11 ref, 2 tables. *A* *Ceg Sjk*

**Can running faults with end-mills and cutter-heads be avoided?** Sind Rundlauffehler bei Stirnfraesern und Messerkoepfen vermeidbar?

Anon. *Technica* 1960 Vol 9 (2) pp 72-74 (Jan 15) (In German)

7 illustr. *K* *Cfj Pd.2591/Pd.2591*

**Cutting tools**

D. G. Jones. *Mach Tool Blue Bk* 1960 (1) pp 87-89 (Jan)

The application of the throw-away insert principle to specialized multiple-point tooling is said to offer solutions to some difficult tooling problems. Examples are given. 3 illustr. *D* *Pdcb*

*D* *Pdcb*

**Drilling thrust and torque**

H. Conn. *Mach Tool Blue Bk* 1960 (1) pp 93-99 (Jan)

4 illustr, 2 tables. *D* *Cfb Unlg/Uql*

**The effects of cutting speed on chip deformation when machining aluminium alloys**

A. Kardos. *Acta tech hung* 1959 Vol 26 (3-4) pp 423-433; *Engrs' Dig* 1960 Vol 21 (1) pp 104, 106 (Jan) (Original in Hungarian)

3 illustr. *D* *Bfxc Ceq Uqfb*

**How to evaluate cutting tools**

C. J. Oxford jun. *Amer Mach* 1960 Vol 104 (1) pp 82-84 (Jan 11)

4 illustr. *D* *Pd.21*

**The enemy: beryllium dust**

R. Le Grand. *Amer Mach* 1960 Vol 104 (1) pp 86-87 (Jan 11)

An article on safety measures used by Bendix Aviation Corp when machining beryllium includes shop notes on machining sintered beryllium. 3 illustr.

*D* *Bfu Ceq.2595*

**Fundamentals of economic manufacture—16**

W. F. Walker. *Tooling* 1960 Vol 14 (2) pp 49-56 (Feb)

This part deals with auxiliary equipment for the horizontal boring machine, boring bars and other tooling. 16 illustr. *D* *Cfd Pr.26*

**The effect of using constant cutting speed during facing operations on a centre lathe**

S. Kumar. *Prod Engr* 1960 Vol 39 (2) pp 112-121 (Feb)

Tables compare surface quality with cutting speed when using HSS and tungsten carbide tools. 6 illustr, 9 ref. *D* *Pdb Uqfb*Pdc Uqfb*

**The rare earth metals as engineering materials**

Anon. *Min J* 1959 Vol 253 (6484) pp 534-535 (Nov 27)

Rare earth metals, or 'lanthenons', comprise the fifteen elements from lanthanum to lutetium. In 1959 it was announced that all these had been successfully produced in the UK. Six have been extruded and drawn to fine wire satisfactorily. In the US many uses are being found for the metals and their alloys and workability characteristics are expected to improve by increasing their purity. The only problem so far in turning, milling, grinding, sawing, drilling, and tapping rare earth metals is the tendency for fine particles and chips to catch fire under conditions where sparking is caused at the working point, but this can be obviated by flooding the work and cutting tool with an oil coolant.

*D* *Bf.21*

**Five spindle turret drill head**

G. I. Eizer. *Machines & Tooling* 1959 Vol 30 (9) p 45 (Original in Russian)

Five spindle turret drill head is used on model S8 bench drilling machines for machining holes up to 8 mm (0.315 in.) diameter when drilling, countersinking, reaming and tapping. The head is intended to reduce auxiliary time and to increase operating efficiency. It consists of a stationary body and a rotating member with five spindles. The tools are fixed in the spindles by collets and drill chucks. 1 illustr.

*D* *Cfb Pr*

**Machining radiused surfaces**

I. K. Linnikov, V. E. Baryshev. *Machines & Tooling* 1959 Vol 30 (9) p 45 (Original in Russian)

Surfaces described by an 3.346 in. radius in a component illustrated are machined on a slotting machine. This ensures high positional accuracy of the machined surface to the base hole. The process is discussed. 2 illustr. *D* *Az Ceq*

**Tooth cutting tools**

D. M. Korytny. *Sowjet Buchneuerschein Vorankuendigungsdienst* 1959 (43) pp 15-16 (Original in Russian)

Book, Mashgis, 1959, 112 pp. Price DM 1.25.

[Not in library of Industrial Diamond Information Bureau]. *A* *Ad Ceg Pd*

**Temperature deformations in cutting tools**

E. V. Ryzhov. *Russ Engng J* 1959 (4) pp 62-64 (Original in Russian)

5 illustr, 4 ref. *D* *Pd Unk*

**Determination of the machining accuracy in the use of profile tools**

S. K. Darmantschew. *Sowjet Buchneuerschein Vorankuendigungdienst* 1959 (44) pp 15-16 (Original in Russian)

Book, Mashgis, 1960, 128 pp. Price DM 2.50.

The basic theory and the methods of determining machining accuracy of profile tools are considered. Formulae are suggested which are applicable to the most important types of profiling tools: profile cutters and milling tools.

[Not in library of Industrial Diamond Information Bureau]. *A* *Pdz.21*

**New developments in the theory of the metal cutting process, I—The ploughing process in metal cutting**

P. Albrecht. 1959 *ASME Annual Mtg Paper* (59-A-243); abstr *Mech Engng, NY* 1960 Vol 82 (1) p 70 (Jan)

*D* *Bf Ceg.132*

**Heavy-duty thread milling.** Hochleistungs-Schneckenfraesen

E. Burbeck. *Industrieblatt* 1959 Vol 59 (12) pp 653-659 (Dec 25) (In German)

The article discusses the advantages in efficiency and price of modern methods, especially the use of insert cutters in heavy duty thread milling. It stresses the need for correct and careful sharpening of the cutters and gives advice on this subject. 26 illustr, 4 tables.

*K* *Az Cff*

**A further review of machine tools.** Ein weiterer Querschnitt ueber Werkzeugmaschinen

Anon. *Industrieblatt* 1959 Vol 59 (12) pp 682-684 (Dec 25) (In German)

Experiments carried out in the field of steel and sintered carbide tool machining since 1951 have given rise to a varied range of models. 7 illustr.

*K* *Pr.25*



**Carbide inserts give copy turning economy**

B. Almen. *Metalworking Prod* 1960 Vol 104 (3) pp 95-98 (Jan 20)

The greatest economy from cutting tools with carbide inserts is only obtained when the cutting speed gives the most economical tool life. This article, with examples from Sandvik copy turning tools, shows how maximum economy can be obtained. 9 illustr.

*X* *Ceqbz Pdcb*

**Non-Russian universal screw cutting and production lathes (short review)**

B. A. Gladkov, E. A. Kaganov. *Machines & Tooling* 1959 Vol 30 (9) pp 37-42 (Original in Russian)

19 illustr. *D* *Ceqbd Pr*

## CUTTING AND MACHINING OF STONE, GLASS, PLASTICS, ETC

**Production lapping of semi-conductor crystals**

Payne Products International Ltd, Lawrence Estates, Green Lane, Hounslow, Middx. *Mach Shop Mag* 1960 Vol 21 (2) pp 103-104 (Feb)

Machine lapping for the precision finishing of flat surfaces is described, with special reference to lapping and polishing crystalline materials used in transistor manufacture. A special technique used on Lapmaster rotary lapping machines is said to replace most existing methods and to eliminate frequent re-dressing of the lap plates. Crystals of germanium, silicon, and quartz can be lapped and polished to a thickness of 0.0015 in. with a tolerance of 0.0001 in. and parallel within 0.0001 in, or better, it is claimed. The procedure is outlined. At one stage a diamond fixture is used. Crystals are mounted on a steel plate, the surface of which is flat within one light band. Three diamond points, attached to the working surface of the plate, are pre-set to any desired size; being resistant to aluminium oxide abrasive, they act as positive stopes and control the lapping operation to the required limit. A solid lapping plate replaces the standard plate since the radial slots in its surface prevent snagging of the diamond points.

*D* *Bde Chc Nd/Bde Chd Pr*

**Colloquium on the qualities of polished glass surfaces.** Kolloquium ueber die Beschaffenheit polierter Glasoberflaechen

R. Meister. *Glastech Ber* 1959 Vol 32 (12) p 508 (Dec) (In German)

The Union Scientifique Continentale du Verre held its colloquium in Paris in November 1959. After a critical review of the literature of glass polishing, two papers were read on the polishing processes of glass, and the testing of polished surfaces with an ion exchange. Further papers covered the physical characteristics of polished glass surfaces, the results of microscopic examination of polished glass, and special methods of testing surface reactions in incident light by means of an interference microscope and the residual diffusion of polished surfaces. *A* *Az Bm Chm.231*

**LITERATURE REQUESTS**

**Please quote the page number of the journal which contains the original reference, and the author and title of the article, in all cases.**

**Ground ceramic key for harnessing H-bomb energy**

Anon. *Grinding & Finishing* 1959 Vol 5 (8) pp 14-15 (Dec)

Grinding with a 320 grit diamond wheel has a vital part in finishing a ceramic liner, shaped as a 49 in. long and 20 in. diameter cylinder, which forms part of a ceramic chamber being built to contain a reaction which may reach temperatures five times that of the sun. The high alumina liner is ground to a tolerance of ±0.001 in. and the surface is almost polished. 1 illustr.

*D* *Az Bl Chc Nv*

**Glass base laminated plastics**

E. C. Graesser. *Mach Tool Blue Bk* 1960 (1) pp 107-112 (Jan)

For sawing, a diamond impregnated wheel with a copper body 1/16 in. thick and 12 in. diameter run at 3,000 to 3,600 rev/min will give good results cutting dry with an adequate exhaust system. Shearing and slitting, drilling, threading and machining are among other operations described. 6 illustr.

*D* *Bp Ceg Nvc*

**Metal crystal specimens**

Anon. *Compr Air (Mag)* 1959 Vol 64 (12) p 28 (Dec)

Much higher rates of strain-free cutting of metal crystals for laboratory specimens can be achieved by an electrolytic saw described in an Office of Naval Research technical report. *D* *Bfa Cejz*

**BP 821,703** (Aug 14, 1956) **Crane Packing Co**

**Lapping machines**

This is a work holder for a lapping machine (*see* BP 726,851) for lapping very thin articles, such as piezoelectric crystals, to a high degree of flatness and parallelism and also very accurate angular faces on larger articles such as optical prisms. The holder seen in Fig 19 and 20 is formed as a block 10 to whose flat underside the article A is stuck by applying a small amount of moisture. The block is held on lapping plate 14 within conditioning ring 18 with its weight resting on the crystals to be lapped. Three adjustable legs 40 act as stops to terminate the lapping process. These legs 40 carry diamonds 46 with rounded ends which engage the lapping plate 14 when the crystals have been lapped down to their desired thickness. Figs 21 and 22 illustrate a similar holder arranged for lapping face 74 of a prism A'. (9 claims, 9 illustr).

*J* *Chd Pr.545*

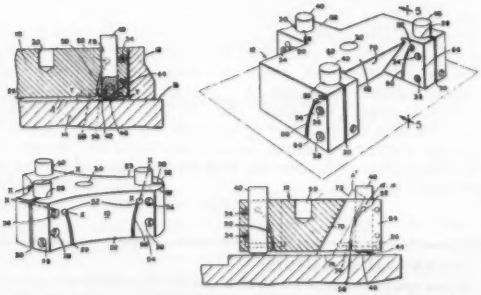

*Fig 19 and 20 (left). Work holder formed as a block 10. Fig 21 and 22 (right). A similar holder. BP 821,703.*

**BP 822,058** (Nov 1, 1956) **L. H. Metzger, Super-Cut Inc**

**Grinding wheel**

The glass grinding wheel is a metal disk. On its front face is arranged a number of arcuate grinding segments in three stepped rings, large, medium, and small, so that the outermost or largest segments first grind the glass to a certain depth, then the other segments grind it successively to progressively greater depths. The segments are mounted in staggered rows in annular grooves where they can be adjusted individually. Through ducts between the grinding rings coolant is supplied to the surface during grinding. The size of the diamond particles embedded in the segments may be 100 to 140 mesh in the outermost (coarse) row, 170 to 200 mesh in the second (medium) row, and 320 mesh in the inner (fine) row. (8 claims, 6 illustr).

*J* *Bm Chc Pe.545*

**BP 824,400** **Technical Ceramics Ltd**

(Feb 27, 1956—conv date, USA)

**Ultrasonic drill**

A number of drilling tools is attached to the horn of the transducer of piezoelectric material. The transducer is made in the shape of a bar or slab, *eg* of polarized barium titanate. A set of transducers may be used to act together as a single piezoelectric bar. The drill will cut a number of holes corresponding to the number and shape of the different tools to the same predetermined depth, so that it is not necessary to interrupt the cutting process to check the depth as in previous arrangements when, *eg* for intaglios in brittle material, several cuts of different shapes had to be made to the same depth. (4 claims, 3 illustr). *J* *Cfbk Pl.545*

**BP 824,457** **Pittsburgh Plate Glass Co**

(Sep 24, 1956—conv date, USA)

**Method and apparatus for cutting glass sheets**

The usual method of cutting glass is to score the sheet with a diamond or a tungsten carbide wheel cutter 1/32 in. thick and with a V-shaped edge with an included angle of between 98 and 158° dependent on the type and thickness of the glass plate. After scoring, a certain amount of force is used to open or run the cut. It has been found that a considerably deeper score line can be produced, which is then sufficiently deep for the cut to run automatically through the glass, if ultrasonic vibrations are imparted to the wheel. The V-shaped edge of the wheel of a thickness between 1/32 and 5/32 in. has preferably an included angle between 135 and 168 degrees. Wheels with an included angle of 98° or less or of more than 168° are inoperative for scoring with simultaneous running of the cut. The load on the wheel is preferably 12 to 20 lb, the scoring speed 9 to 25 ft/min, the ultrasonic frequency 20 to 80 kc/second. (20 claims, 3 illustr).

*J* *Bm Ceg Ncb.545/Bm Ceg Pds.545*

**DAS 1,061,663** (Apr 27, 1955) **J. Heidenhain, Wenczler & Heidenhain Patentverwertung**

**Method for making graticules, divisions, figures and markings on hard material such as hard metal, glass, porcelain.** Verfahren zum Herstellen von Strichplatten, Teilungen, Figuren und Marken auf harten Werkstoffen, wie Hartmetall, Glass, Porzellan

The method uses an ultrasonic drill. Hitherto markings for optical instruments have been made by photomechanical means. For certain applications burins have been used. Both methods result in insufficiently accurate markings. This new method uses a known ultrasonic drilling machine which permits accuracies of less than 0.001 mm, at the same time leaving the walls polished. As the drill does not rotate but vibrates longitudinally at 25,000 hertz, it is possible to combine a number of drill points to form a profile

or several profiles, *eg* by a photomechanical method in combination with an etching procedure, so that most complex forms may be produced. The cavities resulting from the drilling operation may be filled with a material different from the glass or other plate with regard to its reflectiveness, colour permeability or other properties. The carrier plate may also be composed of two layers of different behaviour towards a third layer applied by evaporation *in vacuo* to fill the drilled cavities. (4 claims, 6 illustr). Ref cited : 3 USP ; 1 DRGM ; 1 book.
*J* *Cpz.545/Blb Cpz.545/Bm Cpz.545*

**DAS 1,063,769** (Oct 7, 1957) **A. Bohle, Josef Bohle**
**Glass cutter.** Glasschneider
(1 claim, 6 illustr). Ref cited : 1 FP.
*D* *Bm Ceg Pds.545*

**DAS 1,063,770** **T. Hofman, C. W. Hofman**
(July 31, 1954—conv date, Netherlands)
**Device for cutting spectacle lenses.** Vorrichtung zum Schneiden von Brillenglaesern
The spectacle frame serves as template for guiding the cutting diamond so that the diamond cuts the glass intended for that portion of the frame which is used as guide. The device is characterized by two rotary tables one above the other, the lower one carrying the frame and the upper one carrying the glass blank to be cut ; and by an auxiliary support with a swing arm carrying a feeler mechanism at its lower part and a glass cutter at is upper part detachable from the frame table. (4 claims, 11 illustr). Ref cited : 1 DBP.
*J* *Bm CegTh.545*

## GEM POLISHING

**Faceted gemstones [:] cutting for maximum brilliance**
O. LeM. Knight. *J Gemm* 1960 Vol 7 (5) pp 167-177 (Jan)
Hardness, specific gravity, refractive index, critical angle, and degree of colour dispersion must all be considered when determining the proportions of any gem, if the maximum brilliance is to be obtained. Although the diamond industry has applied the theoretical values revealed by research and confirmed in practice, the author states that for other classes of gems these studies have been largely ignored. For the 'brilliant' type of cut it has been proved that the theoretically ideal proportions result in maximum brilliance. For other cuts the same general principles apply, although it is impossible to set down precise ideal proportions. This article explains the basis on which ideal proportions have been calculated and summarizes the results. A table gives theoretical optimum proportions for brilliant-cut gemstones, including diamond. 5 illustr, 5 ref, 1 table.
*D* *Bb Ceg Ubg*

**Gemstone cutting practice.** Aus der Praxis des Edelsteinschleifens
E. Frey. *Dtsch Goldschmiede Ztg* 1960 Vol 58 (1) pp 17-19 (Jan) (In German)
In the polishing of gemstones, the correct combination of polishing apparatus, polishing material, and materials worked is very important. The article includes lists of the various kinds of polishing apparatus and materials and a list showing the kinds of stone for which they should be used. 1 table.
*K* *Bb Chm*

**BP 821,157** **J. Sigaar**
(Dec 21, 1955—conv date, France)
**Improvements in or relating to the manufacture of jewellery**
A single stone is simulated by fitting a number of separate stone elements together without paste or solder and holding them solely by a setting applied to the outer edge of the composite stone. The simulated large stone thus consists of *eg* a central stone having a table, a number of lateral stone "bezels", and four corner stones. The central stone has a bevel around the table against which abut the small stone portions. Its under part is frusto-pyramidical and ends in a "culet". The composite stone may consist of diamonds or coloured stones. (4 claims, 4 illustr).
*J* *Tg:Qc.545*

## ROCK DRILLING

**New drilling technique recovers 100 per cent continuous core**
H. Henderson, J. F. Earl. *World Oil* 1960 Vol 150 (1) pp 111-118 (Jan)
A method using dual drill pipe, a highly portable rig, electric swivel, and a new concept of circulation practices has proved 100% successful in recovering cores for depth drilled during tests in Texas. A continuous core may be taken from the grass roots to total depth ; a reverse circulation method operates by circulating down the pipe annulus and up the central core tube. Present applications include cutting a 4¾ in. hole and retrieving a full gauge 2 in. core. The core is cut and broken off in 6 in. increments and circulated to the surface through the core tube, which extends through the top of the derrick. The core is retrieved in trays from the shale shaker and placed in sequence for the full section of the hole cut.
Bits currently in use are diamond or bladed types, depending upon anticipated lithology. This technique can be used in future for hydrocarbon and/or other minerals, and, it is thought, may prove valuable to development drilling. Geological aspects which can be evaluated by the method are outlined and adaptability to development drilling is considered. 6 illustr, 1 table.
*D* *Cfb Plb.12.1456*

**Pre-cementation in shaft sinking**
Anon. *'Mindrill' Bits & Pieces* 1959 Vol 12 (7) pp 2-4 (Nov) ; *Optima* 1958 Vol 8 (2) pp 96-98 (June) ; abstr *Industr Diam Abstr* 1958 Vol 15 p A121 (Aug)
*D* *Az Cfb Nh*

**Developments in Russian mining machinery**
Anon. *Min J* 1959 Vol 253 (6476) p 311 (Oct 2)
The development of a 'cosmic drill' is reported. For use in hard rock, it works with temperatures three times as high as that of the sun's photosphere and at cosmic velocities. Essentially an electric arc unit, the device is claimed to burn all known hard alloys, ceramic and refractory materials, and to have proved in tests that it can drill the hardest rocks much faster than a thermal drill.
*D* *Cb Pr.33*

**Developments in Russian mining machinery**
Anon. *Min J* 1959 Vol 253 (6479) p 393 (Oct 23)
Scientists at Dniepropetrovski Mining Institute have developed bits of a new type for butt-end drilling with mounted electric drills. It is claimed that drills fitted with this will be the first in the world which can be used for drilling blast holes in hard rock by the rotary technique.
*D* *Cb Pr.33*

**Using a diamond drill in drilling through reinforced concrete**

S. Sinclair. *Civ Engng, Lond* 1959 Vol 54 (640) pp 1301-1302 (Nov)

The technique of diamond drilling through reinforced concrete and the particular adaptations used in this case are described. Drilling was necessary to provide an access door through the concrete biological shield of a radio-active cell in the Primary Separation Plant at Windscale. It was not possible to use pneumatic pick hammers and the diamond drill had to be used in a novel and effective way to overcome restrictions, including a danger of radioactivity. A series of holes were bored round the perimeter of the opening, the periphery of each hole cutting into that of the next, and the complete block of concrete removed after it had been isolated from the wall. The job was successfully completed. 5 illustr. *D* *Bny Cfb Nh*

**Drill and blast technique**

Anon. *Z Ver dtsch Ing* 1960 Vol 102 (1) pp 21-23 (Jan 1) (In German)

Among reasons for Soviet success in turbine-drilling is the development of new kinds of bits which reduce bearing friction. With regard to core-drilling, diamond bits for deep shafts of small diameter show promise; and for changes in direction of drilling, special bits have been designed. *K* *Az Cfb Nhe*

**Exploration drilling techniques**

V. N. Burnhart. *Min Congr J, Wash* 1959 Vol 45 pp 66-68, 75 (Aug); *IMM Abstr* 1960 Vol 10 (2) p 65 (Dec-Jan)

Developments are noted with reference to drill hole circulating pumps, stabilization, drill rods (W series), industrial diamonds, diamond bit design, mobile drills, combination plug and core drilling, wire line tools and techniques. *X* *Cfb.12*

**The course of progress made in geological prospecting.** Pour le poursuite du progrès technique des travaux de prospection géologique

B. N. Erofeev. *Prospection et Protection du sous-sol* 1959 (7) pp 1-4 (July) (In French, original in Russian)

In a general article, the writer complains that work on improving the quality of various drilling equipment, including multi-diamond drilling crowns, is not sufficiently controlled by the Ministry. He suggests a seven-year plan with the aim of creating a new drilling technique using new types of hard alloys, drilling crowns, and other equipment.
*K* *Cfb Nhg.12.33*

**Inclination and direction of drill-holes**

Swedish Diamond Rock Drilling Co. *Min J* 1959 Vol 253 (6481) p 450 (Nov 6)

A new survey instrument, the Craelius Electro-magnetic Dip Indicator, quickly and accurately determines the inclination of drill holes and can be used even in magnetic surroundings. The design, operation, and practical application of the instrument are described. *D* *Az Qd*

**Mining projects in Australia**

Anon. *Min J* 1959 Vol 253 (6478) pp 360-361 (Oct 16)

A large area of virgin country will be diamond drilled from underground drill sites by Lake View & Star Ltd at the Imperial shaft near the Golden Mile. New orebodies are suspected after geological mapping. When originally worked the mine produced 748.78 fine oz of gold. Diamond drilling is also planned in South-West Tasmania, where mineral prospecting has proved promising. *D* *Be Cfb Nh.38*

**Anchored core drill**

Diamond Core & Saw Div, Portomag Inc, 1521 E Nine Mile Rd, Ferndale 20, Mich. *Rds & Str* 1959 Vol 102 (11) pp 156-157 (Nov); *Diamond News* 1959 Vol 23 (3) p 15 (Dec)

A new diamond core drilling machine with an air-vacuum mounting base has been developed. Normal vibration is said to be absorbed by vacuum pads and not transmitted to the drill itself. Thin wall diamond bits for ¼ in. to 14 in. diameter cores, and vacuum mount attachments are available for converting all makes of diamond core drilling machines. 1 illustr.
*D* *Nhe*

**The Coromant cut**

Sandviken Steel Works Co Ltd, Sweden. *Min J* 1959 Vol 253 (6485) pp 570-571 (Dec 4)

The Coromant Cut is the name applied to a new method of drilling in small drifts with lightweight air leg rock drills to give a much greater advance per round than is now accepted as normal.
*D* *Bn Cfb.1456/Bn Pl Uqe*

**Drilling costs reduced with aerated seawater**

G. A. Krahn, E. B. Rubsamen jun, S. J. Mathews jun. *World Oil* 1960 Vol 150 (1) pp 125-128 (Jan)

One of the latest developments in the technology of rotary drilling fluids has been the addition of compressed air to seawater, pioneered by Gulf Oil Corp for drilling in areas of extreme lost circulation where an abundant supply of seawater is available. Experiments with aerated seawater at Florida Keys were successful after conventional mud systems had failed. The Cay Sal Bank Well I was recently drilled from the surface to 15,138 ft using this technique. The work there is described. 5 illustr, 2 tables.
*D* *Cfb Qs Sgz*

**Unusual drilling project**

Anon. *'Mindrill' Bits & Pieces* 1959 Vol 12 (7) pp 4-5 (Nov)

A Mindrill F 20 diamond drilling machine, with Mintung specially designed 6 in. thin-walled diamond bits, drilled a series of holes through 6 ft of steel-reinforced concrete into a chamber which will house a container of radio-active cobalt. The holes were begun with a 2 ft × 6 ft in. diameter starting band, followed by a 4 ft barrel which produced cores about 5½ in. in diameter. Both machine and bits were in excellent condition at the end of the work. 1 illustr.
*D* *Bny Cfb Nh*

**Drilling record claimed**

Anon. *Civ Engng, Lond* 1959 Vol 54 (639) p 1159 (Oct)

John Thom Ltd report that a nine men crew reached a depth of 5,515 ft in six days during work on a contract in Lancashire. This is belived to be a record depth in the UK. About 75% of the depth drilled was achieved by the diamond coring method, beginning with 11¾ in. diamond crowns. The hole size is 3¾ in. diameter. *D* *Az Cfb Nhe.321*

**DIAMOND TECHNOLOGY**

**First published 1942 as "Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 54s 6d, post free.**

**The influence of the rock structure and the drilling method on drill wear.** Der Einfluss der Gebirgsverhaeltnisse und der Bohrverfahren auf die Bohrlochabweichung

Anon. *Prezeglad Gorn* 1958 Vol 14 (7-8) pp 381-397; abstr *Glueckauf* 1959 Vol 95 (23) pp 1482-1483 (Nov 7) (Original in Russian, abstr in German)

*A* *Bn Cfb Pl Unr*

**BP 822,029** (Mar 15, 1956) **J. S. Barker, G. A. Guppy, B. G. Fish, Coal Ind (Patents) Ltd**

**Scroll-type drilling tools**

The drill is intended for wet rotary drilling of rock. A scroll type drill bit as shown in Fig 23 and 24 is provided with a recess 3 into which fits square-section spigot 2 of drill rod 1 shown in Fig 25. 11 are holes for flushing water fed through axial hole 12 in rod 1.

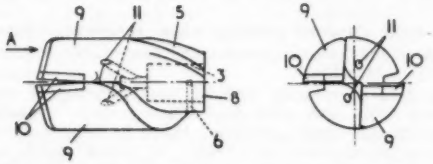


*Fig 23 and 24 (above). Scroll type bit with recess 3, which fits spigot 2 of drill bit 1, shown in Fig 25 (immediately below).*

*Fig 26 (bottom). A view of bit and rod assembled. BP 822,029.*

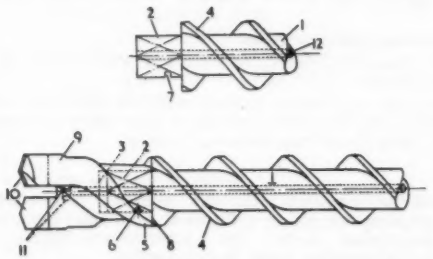


Fig 26 is a view of bit and rod assembled. The combination permits high penetration rates in rock with a minimum of clogging of drilling debris, a minimum of flushing water, and avoids mechanical failure of the drill. (5 claims, 6 illustr). *J* *Pl.545*

**USP 2,902,258** (Mar 30, 1956) **A. B. Hildebrandt, Jersey Production Research Co**

**Vibrating bit assembly**

The conventional rotary rock drilling bit depends to a very great extent for its cutting action upon compressive stress by excessive weight on the bit. Rocks subjected to alternating stresses will fail rapidly in fatigue, an effect present to some extent when toothed cutters roll on the rock surface. Alternating stresses without using excessive weights, which may buckle the drill pipe, can be caused by a vibrating reed-type drill producing high frequency impact (50 to 100 per sec) to the formation being drilled. The reed element is longitudinally disposed within the drill collar, the lower end being attached to the bit. It is arranged pivotally about a transverse axis. A restricted passage in the drill collar acts as a nozzle to direct the drilling fluid down against the upper edge of the reed. (5 claims, 2 illustr). Ref cited : 2 USP. *J* *Cfbf Pl.545*

## WIRE DRAWING

**Hot drawing lubricants**

Anon. *Indian Wire Industr* 1959 Vol 11 (12) p 170 (Dec)

Dag Colloidal Graphite, claimed to be the only lubricant which will adhere to metals at red heat, is widely used for all hot drawing operations. Its uses when drawing tungsten, molybdenum, and steel are described. The Acquadag mixture is used to lubricate tungsten wire down to the finest sizes; for the finest drawing through diamond dies, the concentration of the mixture in the lubricant is slightly higher than for coarser wires.

*D* *An Bfp Cn Sj/An Cn Nkb Sj*

**Six-spindle polishing machine.** Sechspindlige Poliermaschine

Anon. *Draht* 1960 Vol 11 (1) p 32 (Jan) (In German)

A six-spindle polishing machine to be used for diamond dies of 1.5 mm to 0.050 mm diameter is discussed. The dies are rotated upon die-holders while the polishing needles move up and down. 1 illustr.

*K* *Chm Pr*

**Estimating a draw die**

P. Prikos. *Mach Tool Blue Bk* 1960 (1) pp 102-104 (Jan) 2 illustr. *D* *Px*

**USP 2,899,747** (June 27, 1955) **J. T. Weir, US Steel Corp**

**Method of measuring the bearing length of drawing dies**

The length of the bearing section of a finished wire drawing die has usually been determined by visual inspection without uniform accurate measurement, although the measurement of entrance and back relief angles has been assisted by some mechanical devices and optical apparatus. However, it is possible to find the bearing surface length of a die with a conventional optical measuring instrument even though it may be a matter of 0.0001 in. only in many instances. In Fig 27, 2 is a monocular microscope with a screw micrometer 4 on the eyepiece which moves a cross-hair over a small scale 6. The die W is mounted at an angle on holder 8 of a micrometer microscope stage 10. The bearing surface is illuminated by 12. The inclination of the die is preferably 30 degrees. The length B is determined by measuring length A on the microscope scale and applying the sine formula Sine $\theta = \frac{A}{B}$.

(1 claim, 1 illustr). Ref cited : 4 USP; "Instruments" 1947.

*J* *Pse Uqm.545*

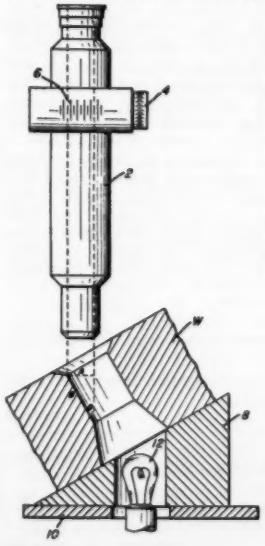


*Fig 27. Set-up for measuring bearing length. USP 2,899,747.*

# GRINDING AND POLISHING OF CARBIDES AND METALS

**Grinding toxic materials**

Anon. *Metal Ind, Lond* 1960 Vol 96 (3) p 47 (Jan 15)

Apart from any problem of radio activity, the toxic character of the dust produced makes special precautions necessary for the grinding of certain materials used in the production of atomic energy. The latest Wickman-Scrivener model O centreless grinder, with special equipment designed by Arthur Scrivener Ltd, has a transparent plastic hood with doors to give access to the machine controls when needed, the work being fed to the grinding throat from a small vibratory hopper. Thus, this model helps to meet the problems of dust extraction posed by the design of centreless grinders. *D* *Bz Chc Ty.2596*

**Grinding operations with coolant delivery from inside and outside the grinding wheel**

B. P. Martinov, A. I. Rivkin. *Machines & Tooling* 1959 Vol 30 (9) pp 21-24 (Original in Russian)

Delivery of coolant lubricant from the inside of the grinding wheel, *ie* through the pores, has been investigated during the past few years. At present a number of firms, including American and German manufacturers, are producing grinding machines whose design allows this method of cooling. Advantages shown by tests include: increased productivity rate while maintaining quality requirements and reducing wheel dressing; lower expenditure on grinding wheels and dressing tools; improvement in component quality due to less possibility of burns and distortions; and better surface finish.

Experiments carried out by ENIMS in 1957 to test results when coolant was delivered from two directions are described and results are compared. It was concluded that simultaneous cooling from inside and outside the wheel increased technical and economic effect compared with cooling from outside only. Secondary conclusions are recorded. 8 illustr, 12 ref.
*D* *Chc Pe Qs Sjg*

**New matrix jig grinder works hardened material without distortion**

Rockwell Machine Tool Co Ltd, Welsh Harp, London NW 2. *Mech World* 1960 Vol 140 (3486) pp 12-13 (Jan)

The new Matrix 56-12-18 jig grinder is said to work hardened materials without distortion and to hold close tolerances, thus solving problems of maintaining tolerances when hardening finished parts. The high frequency spindle has four speeds from 12,000 to 50,000 rev/min, and can maintain a constant speed irrespective of load. The collet nose permits the use of diamond impregnated stalks or grinding spindle quills. The machine is said to be vibration-free and fully protected against dirt. Quick power controls followed by fine hand adjustments enable fast setting to 0.0001 inch. 2 illustr. *D* *Az Chc Pr*

**Grinding wheel speeds**

Anon. *Canad Mach, Annual Directory (1960)* 1959 Vol 70 (12) p 155 (Dec)

A data sheet gives peripheral speed in ft/min for wheel diameters from 1 to 34 inches.
*D* *Pe Uqfc*

**Centreless grinding of ball pins.** Spitzenloses Schleifen von Kugelbolzen

A. Scrivener Ltd, Birmingham. *Werkst u Betr* 1960 Vol 93 (1) p 40 (Jan) (In German)

2 illustr. *K* *Az Chcc*

**The grinding technique and its importance for the proper use of carbides in the woodworking industry**

T. Englesson. *Industr Diam Rev* 1959 Vol 19 (228) pp 206-210, 212-213, 219; (229) pp 232-236

The cutting tools used in the woodworking industry are frequently of metal carbides, which lie between corundum and diamond in the hardness scale and must therefore be sharpened with diamond grinding wheels. Corundum wheels can be used for removing the steel to which the carbide is fixed. Rough grinding may be done with silicon carbide wheels. These normally have a grain size of 46, 60, 80 or 120, while the diamond wheels are available from 80 to 700, and the diamond wheels have a lower concentration of particles/unit volume than the silicon carbide. Bonds must be chosen to suit the purpose of the wheel. Grinding machinery, accuracy, cutting efficiency, and investigation of wear are discussed. 19 illustr, 6 ref, 1 table.
*A* *Al Bkc Chc Nv/Bz Ceq Pdc*

**Man-made diamond grinding wheel recommendations**

Anon. *Canad Mach, Annual Directory (1960)* 1959 Vol 70 (12) p 182 (Dec)

A data sheet deals with off-hand grinding of single-point tools, and with chipbreaker surface, cylindrical, surface and cutter grinding. Form holding is covered. Recommendations are made on wheel types, sizes, numbers and gradings. Results of tests when grinding sintered tungsten carbide tools with synthetic and natural diamond wheels are compared: synthetic diamond is claimed to have averaged 35% longer life than natural diamond in vitrified and resinoid bonded wheels and to have had other advantages. A diagram shows four types of synthetic diamond wheel shapes. 1 table, 1 illustr. *D* *Nv*Nvh*

**Controlling abrasive costs**

C. F. Brown. *Grinding & Finishing* 1959 Vol 5 (8) pp 32-34 (Dec)

Advice on abrasive product selection deals with wheel shape, size, abrasive type, grain size and classification, and other important factors. 1 illustr.
*D* *Pe.21*

**Results of research into the grinding properties of grinding wheels in cylindrical grinding.** Forschungsergebnisse ueber die Schleifeigenschaften von Schleifscheiben beim Rundschleifen

E. Koellner, Z. Vavra. *Strojirenstvi* 1958 Vol 8 (11) pp 845-850; *Industrieblatt* 1960 (1) p 64 (Jan 25) (Original in Czech, abstr in German)

Publishes the results of a series of experiments on grinding wheels of varying properties and parameters to determine the interdependence of the various factors involved and to discover an economic grinding process. The writer first explains the experimental methods employed and certain conceptions used as criteria in the evaluation of grinding properties. Results show the influence of hardness, grain size, kind of bond used, and other factors on the technique and economics of the grinding process. *K* *Chc.21*

**Machines for grinding spring ends.** Federendenschleifmaschine

Anon. *Draht-Welt* 1959 Vol 45 (12) p 838 (Dec) (In German)

1 illustr. *K* *Az Chc Pr*

**Machines for polishing, brushing or grinding.** Polier-, Buerst- oder Schleifmaschine

Anon. *Draht-Welt* 1959 Vol 45 (12) p 839 (Dec) (In German)

1 illustr. *K* *Chc Pr/Chm Pr/Chz Pr*

**Light touch for tooth grinding**

Anon. *Compr Air (Mag)* 1959 Vol 64 (11) p 25 (Nov)

For very high speed dental drills an attachment has been developed which indicates the pressure exerted by the dentist on the drill.

*A* *Az Cfb Pld Uql*

**The effects of atmosphere on dry-grinding steel with $Al_2O_3$ coated abrasives**

E. J. Duwell, W. J. McDonald (Minnesota Mining & Manufacturing Co). *Sci Lubric* 1960 Vol 12 (1) p 13 (Jan)

Abstract of a paper presented at the ASLE-ASME joint lubrication conference.

*D* *Pe Rdg*

**Abrasive cutting tools and their operation**

G. M. Ippolitov. *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (8) p 2078 (Nov) (Original in Russian)

Book, Gos nauchno-tekhn, izd-vo mashinostroit lit-ry, Moscow, 1959, 254 pp.

[Not in library of Industrial Diamond Information Bureau]. *D* *Pe.21*

**Grinding**

P. I. Lashcheritsyn. *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (8) p 2079 (Nov) (Original in Russian)

Book, Gos nauchno-tekhn izd-vo mashinostroit lit-ry, Moscow, 1958, 62 pp.

[Not in library of Industrial Diamond Information Bureau]. *D* *Chc.21*

**Strength standards for grinding wheels and norms for consumption of diamond tools**

Anon. *Library of Congress Mthly Index Russ Access* 1959 Vol 12 (8) p 2080 (Nov) (Original in Russian)

Book, Gos nauchno tekhn izd-vo mashinostroit lit-ry, Moscow, 1959, 79 pp.

[Not in library of Industrial Diamond Information Bureau]. *D* *N.255/Pe.255*

**Standard time data for grinding**

E. A. Cyrol, R. L. Borck. *Grinding & Finishing* 1959 Vol 5 (8) pp 28-31 (Dec)

7 illustr. *D* *Chc.21*

**Flat grinding machines.** Flachschleifmaschinen

Anon. *Industr Anzeig* 1960 Vol 82 (2) p 31 (Jan 5) (In German)

3 illustr. *K* *Az Chc Pr*

**Apparatus for grinding the faces of flat workpieces.** Vorrichtung zum Schleifen flacher Werkzeuge an der Stirnseite

Anon. *Industr Anzeig* 1960 Vol 82 (2) pp 31-32 (Jan 5) (In German)

1 illustr. *K* *Al Chc Psc*

**North American tooled up for fighters and bombers of the future**

C. O. Herb. *Machinery, NY* 1960 Vol 66 (5) pp 95-102 (Jan)

After discussing milling machines and operations, describes abrasive belt grinding of such diverse materials as honeycomb core, sheets of titanium alloy and stainless steel by a Farnham machine. Silicon carbide belts of 80 grit are used for rough grinding, *eg* titanium alloy, and 240 grit belts for finish grinding. Aluminium oxide belts are used on stainless steel. Other grinding operations are covered. 14 illustr.

*D* *Az Bfu Chc Pee/Az Chc Pee*

**Honing of stacked parts boosts production and cuts cost**

Micromatic Hone Corp, Detroit, Mich. *Machinery, NY* 1960 Vol 66 (5) p 106 (Jan)

'Horizontal stack-Microhoning', developed by Micromatic Hone Corp, is a process developed to improve the quality of honed surfaces while reducing costs. Several parts are stacked side-by-side and honed as if they were one long part. The process is applied most effectively to cast iron and soft steel short parts. 1 illustr. *D* *Az Chhc Pr*

**Why not 'tumble' into higher profits?**

R. E. Earl. *Machinery, NY* 1960 Vol 66 (5) pp 122-124 (Jan)

Recent developments in precision barrel finishing have widened its application and made it an important and economical method of obtaining low micro-inch finishes. This article gives examples of how and when the process can be used to advantage. 4 illustr, 2 tables.

*D* *Chmz.21*

**Conveyor grinder triples output**

R. L. McKee. *Grinding & Finishing* 1959 Vol 5 (8) pp 25-26 (Dec)

Production per man-hour on a pencil-pointing operation is said to increase 300% when the work-holding conveyor on a grinder supplants off-hand grinding in chamfering alloy steel rods for jet turbine blades. 1 illustr. *D* *Chc Pr*

**Vibrating finisher**

Lord Chemical Corp, Dept MF, 2068 S Queen St, York, Pa. *Metal Finish* 1959 Vol 57 (11) p 100 (Nov)

Lorco model 1016E vibrator for precision finishing uses controlled vibration and is said to work from 10 to 100 times faster than tumbling barrels on such jobs as cleaning, deburring, radiusing, fine finishing and burnishing. *D* *Az Chm Qn*

**Automatic polishers**

Acme Mfg Co, Dept MF, 1400 E Nine Mile Rd, Detroit, Mich. *Metal Finish* 1959 Vol 57 (12) pp 91-92 (Dec)

An improved standardized automatic polishing machine will finish, *eg* reflectors, oval shapes, conical, cylindrical, and bowl shapes in a fully automatic cycle of operation. Parts made of aluminium-clad material, stainless steel, low-carbon steel, copper, and brass can be effectively finished on the new reflector polishing machine, it is claimed. A unique feature is the automatic control of finishing wheel pressure to prevent excessive pressures met when contact surfaces change from large to small radii. *D* *Az Bf Chm Prs*

**Abrasive belts and discs**

Behr-Manning Co, Troy, NY. *Metal Finish* 1959 Vol 57 (12) pp 94-95 (Dec)

A new line of resin bonded aluminium oxide coated abrasive has a sharpness and cutting life never before attained according to the makers. Marketed as Metalite type 101, the new abrasive is available on fibre disks and cloth belts. A modification, 101T, is said to be particularly effective on stainless steel, brass, bronze and other alloys. Increased abrasive life is accompanied by freedom from heating and resulting discoloration of the metal, it is claimed. *D* *Pee*

**REQUESTS FROM AMERICA**

**American readers who wish to order a photostat or reprint of an article abstracted in Industrial Diamond Abstracts are advised to apply directly to the appropriate journal if this is an American publication.**

**Adjustable speed wet grinder**

United States Electrical Tool Co, 3640 Llewellyn St, Cincinnati 23, Ohio. *Mod Mach Shop* 1960 Vol 32 (8) p 171 (Jan)

An adjustable speed wet grinder, model 61 AVSW, is designed for a variety of uses, including sharpening form dies and grinding high speed tool bits. The machine provides constant peripheral speed which is claimed to result in long wheel life and increased production. A coolant pump is available for wet grinding. Maximum peripheral speed for either vitrified or high speed grinding wheels can be maintained for the entire life of the wheel. 1 illustr.

*D* *Al Bfdg Chc Pr/Ax Chc Pr*

**Automatic face mill grinder employs electrolytic stock removal**

Oliver Instrument Co, 1430 East Maumee St, Adrian, Mich. *Mod Mach Shop* 1960 Vol 32 (8) p 187 (Jan)

The electrolytic grinding process has been applied to an automatic face mill grinder. The new combination produces substantial savings in diamond wheel costs and cutter life, while improving workpiece finish due to the face radius and reduced grinding run-out on the face mill. The electrolytic grinding process is said to eliminate the carbide insert cracking and checking normally experienced with conventional grinding methods. 1 illustr.

*D* *Chcr:Ale Chc Prs*

**Electrolytic grinding spindles**

Pope Machinery Corp, 261 River St, Haverhill, Mass. *Mod Mach Shop* 1960 Vol 32 (8) p 205 (Jan)

Pope Machinery Corp is offering precision spindles for electrolytic grinding. The spindles may be motor or belt driven and are available from 1 to 20 h.p. with speeds of 900, 1,200, 1,800 or 3,600 rev/minute. They are supplied to operate from 50 to 3,000 amperes. 1 illustr.

*D* *Chcr Pr Psl*

**Union Twist Drill introduces tangent-arc profile grinder**

Union Twist Drill Co, Hartex Div, Athol, Mass. *Amer Mach* 1959 Vol 103 (27) p 107 (Dec 28); *Mod Mach Shop* 1960 Vol 32 (8) p 170 (Jan)

Hartex (German) No 3 is designed for sharpening cutting tools having radii in cutting surfaces and for grinding clearances on profile, straight or angular cutters. Incorporating a reciprocating horizontal wheelhead and a revolving workhead, the unit can take arbor type cutters up to 10 in. diameter and taper shank mills up to 12 in. overall length. 1 illustr.

*D* *Al Chch Pr*

**Automatic lapping machine laps spiral, bevel and hypoid gears up to 36 in. dia**

Gleason Works, 1000 University Ave, Rochester, NY. *Amer Mach* 1959 Vol 103 (27) p 103 (Dec 28)

An automatic lapping machine can lap spiral, bevel and hypoid gears up to 36 in. diameter with shaft angles from 10 to 130 degrees. 1 illustr.

*D* *Ad Chd Prs*

**Foote-Burt improves its No 2 Hammond surface grinder**

Foote-Burt Co, Cleveland 8, Ohio. *Amer Mach* 1959 Vol 103 (27) pp 104-105 (Dec 28)

A redesigned Foote-Burt-Hammond No 2 surface grinder is a high precision toolroom grinder developed specifically for fine work. Accuracy is said to be ensured by the double-dovetail design of the spindle carrier. Both dovetails have adjustable gibs; the spindle is direct motor driven and is mounted on precision preloaded ball bearings. Other features are described. 1 illustr.

*D* *Al Chcm Pr*

**Precision grinding sewing machine parts**

Anon. *Mod Mach Shop* 1960 Vol 32 (8) pp 144, 146 (Jan)

One Heald model 171 Gagematic equipped with thirty sets of additional fixture equipment and two high frequency heads, in addition to the belt driven head, grinds bores of forty-seven different industrial sewing machine parts at the Chicago plant of Union Special Machinery Company. 1 illustr.

*D* *Az Chc Pr*

**Polishing tube interiors**

Mattison Machine Works, Rockford, Ill. *Compr Air (Mag)* 1959 Vol 64 (12) p 34 (Dec)

Compressed air is used to push an expansible grinding head through long tubes to grind and polish them internally. The grinding head is mounted on a hollow, reciprocating ram rod. Grinding is not done directly by the head, but by a travelling closed-loop abrasive belt that moves along inside the tubes. During grinding and polishing, the tube revolves and the belt is in motion, while the grinding head moves back and forth through the tube. This is said to ensure that the entire surface is uniformly ground. Various grades of abrasive may be used. 1 illustr.

*D* *Ag Chcn Pr/Ag Chmz Pr*

**Grinder performs internal, external, surface grinding**

Russell, Holbrook & Henderson, 292 Madison Ave, NY 17. *Amer Mach* 1960 Vol 104 (1) p 115 (Jan 11)

Revlac Tri-Grinder is a single unit that does internal and external cylindrical grinding and surface grinding. The workhead is swung round 180° to change from chucking or face plate work to work on centres. Mounting the proper quill converts the machine to internal grinding. To change to surface grinding the wheelhead must be swivelled 90° and the holding fixture mounted. Work up to 9 in. between centres can be handled. 1 illustr.

*D* *Chcm Pr/Chcn Pr/Chcz Pr*

**Single- or parallel-face flat lapping machine**

Norton Co, Worcester, Mass. *Engrs' Dig* 1960 Vol 21 (1) p 131 (Jan)

Designed for either single- or parallel-face flat lapping, the new model No 48 Hydrolap high production lapping machine can be arranged for a plain time cycle, for automatic continuous feed, or semi-automatic continuous feed. Special features of the design provide a means of handling a greater range of workpiece sizes at a more productive rate and with far less operator fatigue than have previously been possible, and also a better means of sizing control, it is claimed. 1 illustr.

*D* *Az Chd Pr*

**Cutter grinding fixture designed for horizontal surface grinders**

Montgomery & Co, 401 Morris Ave, Springfield, NJ. *Amer Mach* 1959 Vol 103 (27) p 106 (Dec 28)

A fixture permits grinding and sharpening of plain milling cutters up to 6 in. diameter on a horizontal surface grinder. In many cases it will eliminate the need for a universal tool and cutter grinding machine, according to the manufacturer. 1 illustr.

*D* *Al Chcm Pr*

**Machine polishes 40 ft tubes internally**

Brookes (Oldbury) Ltd, Oldbury, Birmingham. *Metalworking Prod* 1960 Vol 104 (2) pp 62-63 (Jan 13)

The polishing operation is carried out by abrasive strips which are threaded through the tubes and joined to make an endless band before the tubes are loaded into the machine. 1 illustr.

*D* *Az Chmz Pr*

**Internal grinding machine has a wide field of application**
Selson Machine Tool Co Ltd, Sunbeam Rd, London NW 10. *Industr Equipm News* 1959 Vol 8 (19) p 3 (Mid-Nov)

The Strojexport machine type BDA is for individual or mass production, can be used with automatic or manual operation, and has both Gagematic and Sizematic attachments. 1 illustr.

*A* *Chcm Pr*

**Belt grinding machine**
Taylor Tools & Supplies Ltd, Vortex Works, Altrincham, Cheshire. *Mach Lloyd* 1959 Vol 31 (25A) p 52 (Dec 12) (In English, abstr in German & French)

An automatic belt grinding machine can be used in place of milling or shaping machines for certain types of surfacing work where the depth of stock removal is small. It is most suitable for finishing die castings, precision castings or shell mouldings. 1 illustr.

*D* *Chc Pee Prs*

**Universal tool grinding machine.** Universal Werkzeugschleifmaschine
Anon. *Industr Anzeig* 1960 Vol 82 (3) p 37 (Jan 8) (In German)

The article describes a Hungarian tool grinding machine which can be used with different attachments for sharpening various tools, so long as the workpiece does not exceed 500 mm in length and 250 mm in diameter. 1 illustr. *K* *Al Chc Pr*

**Micromatic Spiralap flat lapping machine**
Micromatic Hone Corp, Detroit, Mich. *Machinery, Lond* 1960 Vol 96 (2463) p 189 (Jan 27)

A Spiralap range of flat lapping machines has been introduced by Micromatic Hone Corp, Detroit. A spiral groove in the working surface of the lapping plate ensures uniform distribution of the abrasive compound. A timer in the base can be pre-set to control the lapping period at each cycle. When conditioning is needed, it can be done on the machine with the aid of a second lap. 1 illustr. *D* *Az Chd Pr*

**Shiny nose**
Anon. *Machinery, NY* 1960 Vol 66 (5) p 150 (Jan)

A mandrel for the Nike Hercules nose cone is tracer ground on a Bullard machine. The grinding wheel, kept tangent to the surface, has a line contact and thus combines fast stock removal with smooth finish. 1 illustr. *D* *Alp Chc Pr*

**Infeed control for centerless grinders**
P. Ohringer (Cutler-Hammer Inc). *Grinding & Finishing* 1959 Vol 5 (8) pp 42, 45 (Dec)

Higher production rates and closer piece-part tolerances for infeed centreless grinding have resulted in careful study and development of a new method of infeed control by Airborne Industries Laboratory and Bedlow Company. 3 illustr.

*D* *Chcc Pr Wp*

**DIAMOND TECHNOLOGY**

**First published 1942 as " Production Methods for Diamond and Gemstone." The second edition of this book by P. Grodzinski has been revised throughout and considerably enlarged. 840 pages, 486 illustrations, 94 tables, and indexes. From NAG Press Ltd., 226 Latymer Court, London W 6. 54s 6d, post free.**

**Interesting machine tool feed device.** Interessante Werkstueck-Zubringereinrichtung
Schaudt Maschinenbau GmbH, Stuttgart-Hedlfingen. *Industriekurier* 1960 Vol 13 (13) p 45 (Jan 27) (In German)

The cylindrical grinder is fitted with a feed device which enables cylindrical workpieces of 5-12 mm diameter and 50-100 mm in length to be ground between centres by a plunge-cut process. 1 illustr.

*K* *Chcl Pr*

**Building-block automation . . . applied to broaching**
G. B. Collins. *Tool Engr* 1960 Vol 44 (1) pp 77-79 (Jan)

Designed and built around a standard indexing table, a special machine does a broaching job at the rate of 1,100 pieces/hr, and performs secondary operations on cylindrical brass brush-holder tubes for electric motors. Features are described. 6 illustr.

*D* *Az Cfm Prs*

**Surface grinder**
Elgar Machine Tool Co Ltd, 172-178 Victoria Rd, London W 3. *Industr Equipm News* 1960 Vol 9 (1) p 35 (Jan)

The Wendt model SSR 60 round table precision grinder is designed for grinding hard metal and ceramic tips for lathe and shaper tools with clamping holders, for milling cutters and cutter heads, *etc.* The machine has a 5.9 in. diameter diamond wheel. The high efficiency of the rinsing and cooling system is said to prevent the formation of stress cracks in the ground surface. 1 illustr.

*D* *Al Bkc Chcm Pr:Nv/Al Bl Chcm Pr:Nv*

**Files are diamond coated**
Diagrit Diamond Tools Ltd, Station Rd, Staplehurst, Kent. *Industr Equip News* 1960 Vol 9 (2) p 69 (Mid-Jan)

Electroplated diamond needle and machine files can be used for finishing intricate forms and for filing press tool dies which have shrunk in hardening. They have a multi-directional cut and can also be used to finish tungsten carbide form and press tools. The files are available in seven shapes and in sets of three or seven. There are three basic files : standard straight, about 2 in. long ; long straight, about 3½ in. long ; and long riffer, about 3½ in. long. Various cutting edges for each type are described. Disk and hinged files are also available. 1 illustr. *D* *Nqc/Nqz*

**Beta carbide tool grinder**
Addison Tool Co Ltd, Addison Hse, 28 Marshalsea Rd, London SE 1. *Metalworking Prod* 1960 Vol 104 (4) p 166 (Jan 27)

Built by La Prora of Milan, the Beta 150 carbide tool grinding and lapping machine has worktables mounted on leaf springs to provide an oscillating motion. The grinding wheel spindle is dynamically balanced and runs in sealed bearings which are said to operate 15,000 hr without lubrication. A chipbreaker grinder attachment is available and the machine can be adapted to grind twist drills from 3/16 in. to 1 $\frac{1}{16}$ in. diameter. Another attachment is for grinding straight flute side and face cutters and shell end mills up to 7 in. diameter. 1 illustr. *D* *Al Bkc Chc Pr*

**Carbon bushings reduce vibration in high speed grinder**
Machine Tool Development & Research Institute, Moscow. *Design News* 1959 Vol 14 (21) pp 76-77 (Oct 12)

The grinding spindle with rigidly mounted, gas-lubricated carbon bearings can run at speeds of 50 to 50,000 rev/minute. It is intended for grinding small bores of up to 1 in. diameter. 1 illustr.

*A* *Chc Pr:Qn Psl Tc*

**Coolant clarifier eliminates all scratching at Lycoming**

De Laval Separator Co, Poughkeepsie, NY. *Grinding & Finishing* 1959 Vol 5 (8) pp 37-38 (Dec)

The newly-developed TurboMatic proved 99% efficient, separating micron-sized as well as large abrasive material, when tested recently at Avco Corp's Lycoming Division. General efficiency increased 39% and all the scratches from the grinding of jet turbine blades were eliminated, it is claimed.

*D* *Qeb Sj*

**Films for industry**

Carborundum Co Ltd, Trafford Park, Manchester 17. *Industr Diam Rev* 1959 Vol 19 (228) p 199 (Nov)

Three industrial films made by the Carborundum Company covered diamond grinding wheels, heavy duty silicon carbide grinding, and the use of silicon carbide and aluminium oxide as a refractive material.

*D* *Nv.58:.25/Pdc.58:.25*

**Grinding the Chiswick fly-over**

Anon. *Industr Diam Rev* 1959 Vol 19 (227) p 194 (Oct)

Over 13,000 reinforced high-tensile steel rods, set in concrete beams, were successfully cut-off with a Wolf AG7 high speed, heavy-duty angle grinder, after established cutting methods had proved unsatisfactory.

*D* *Agz Bfdz Ceg Chc Pr*

**Grinder and gaging system for matched hole grinding**

Cincinnati Milling Machine Co, Cincinnati 9, Ohio. *Grinding & Finishing* 1959 Vol 5 (8) pp 65-66 (Dec)

The Cincinnati 4 in. Super Precision grinder with built-in Grind-A-Mate gauging system is said to grind mating parts to fit within a few millionths of an inch. It can also be used to grind single parts such as master gauges and other high-production parts under gauge control. The grinder is claimed to achieve tolerances within 0.000010 in. for roundness, 0.000020 in. for straightness, 0.000025 in. for size, and 4 micro-in. for finish. *D* *Az Chc Pr Wbb*

**Lumsden 90 ML surface grinder**

Alfred Herbert Ltd, Coventry. *Metalworking Prod* 1960 Vol 104 (4) p 167 (Jan 27)

Latest addition to the Lumsden range of grinding machines, the 90 ML, incorporates a new automatic feed control to the wheel spindle ram. It is claimed that with this mechanism it is now possible to pre-set the machine accurately for the amount of stock to be removed. 1 illustr. *D* *Chcm Pr*

**Precision grinding attachment for boring mills and vertical turret lathes**

Standard Electrical Tool Co, Cincinnati, Ohio. *Machinery, NY* 1960 Vol 66 (5) p 166 (Jan)

An existing boring mill or vertical turret lathe can be instantly converted from metal turning to grinding by the installation of a grinding attachment. With this equipment only one set-up of the work is involved. 1 illustr. *D* *Ceqb Pr:Chc Psc*

**Synthetic diamonds for metal bonded wheels**

Anon. *Min J* 1959 Vol 253 (6484) p 544 (Nov 27)

At present, GEC's synthetic diamonds are commercially, available only for vitrified and resin bonded wheels, but further progress is indicated by the company's announcement of a new synthetic diamond that could be used in metal bonded wheels. Possibilities are being investigated with the help of makers of diamond products. *D* *Nvh Urc*

**BP 823,154** (Feb 1, 1955—conv date, USA) **Syntron Co Method of and apparatus for grinding, lapping or polishing**

A reciprocating motion is applied to a lapping surface in a path inclined to this surface. Such a motion creates a feeding action between the lapping surface and the surface of the workpiece which then moves round the lap while rotating about a central axis. In a machine for carrying out the method, the lapping plate is carried by four inclined leaf springs in a frame structure around an electric motor underneath with a central core provided with an electromagnetic coil. By energizing the coil with current impulses the armature secured to the frame is drawn downwardly causing the springs to flex. When the impulse passes, the springs return to their normal position and travel slightly beyond. Synchronism of the vibration with the frequency of the energy impulses is obtained by tuning the springs. The lapping plate is in the form of a bowl with an annular well. Lapping pressure is adjusted according to the weight of the article by a pressure plate, which may also be used for simultaneous lapping of the opposite faces. The lapping surfaces may be provided with grinding cloth or liquid abrasive, or powder may be used, *eg* gamma aluminium, sapphire dust, or cerium dust. (21 claims, 7 illustr).

*J* *Chd Pr.545*

**FP 1,181,873** (Aug 31, 1957) **Super-Cut Inc Grinding wheel for multiple operations.** Meule pour les travaux multiples

See USP 2,867,063 [abstr *Industr Diam Abstr* 1959 Vol 16 p A190 (Oct)].

*D* *Bm Chc Pe.545*

**FP 1,183,270** (Sep 24, 1956—conv date, USA) **E. F. Katzke, Crane Packing Co Method of and apparatus for lapping.** Procédé et appareil de rodage

See USP 2,883,802 [abstr *Industr Diam Abstr* 1959 Vol 16 p A245 (Dec)]. *D* *Chc Pr.545*

**DAS 1,060,736** (Feb 5, 1954—conv date, Switzerland) **Diametal A-G Profile grinding machine.** Profilschleifmaschine

In order to keep the grinding wheel at the optimum angle in relation to the profile to be ground on the workpiece, the wheel in known machines is arranged on the pantograph itself. This means that vibrations are transferred to the pantograph which results in inaccurate profiles. This disadvantage can be overcome by mounting the grinding wheel for rotation about the fixed main shaft of the machine, while workpiece holder and template are arranged on a freely movable control plate connected to the pantograph. (2 claims, 2 illustr). Ref cited: 3 Swiss P ; 1 USP.

*J* *Chch Pr.545*

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## MACHINING DEVELOPMENTS

**In brief . . . electron beam machining**

L. R. Industries Inc, Mount Vernon, NY. *Design News* 1959 Vol 14 (26) p 9 (Dec 21)

By means of electron beam machining, holes and figures can be cut into such materials as diamond, tungsten and Carboloy to widths as small as 40 μ across and with tolerances of ±5 microns. Work is accomplished by a beam of electrons produced by heating a tungsten filament, and accelerating by a potential of 25,000 to 110,000 v. The material at the focus of the beam is volatilized. 1 illustr.

*D* *Bfp Ceqh/Bkc Ceqh/F Hlz*

**Electro-spark machining makes cutlery dies**

A. C. Hobdell, E. A. Oldfield. *Metalworking Prod* 1960 Vol 104 (2) pp 58-61 (Jan 13)

Recommended methods of spark machining cutlery dies, together with estimates of cost. 6 illustr, 4 tables.

*D* *Ax Ceqm*

**Short electric arcs with a reduction in plasma, and electro-spark techniques.** L'arc électrique court a plasma réduit et la technique de l'étincelage

G. Fischer. *Rev gén Mécan Elect* 1959 Vol 43 (128) pp 47-57 (Dec) (In French)

30 illustr, 4 ref. *K* *Ceqm.21*

**The ever-increasing use of ultrasonics in industry.** Les ultra-sons sont de plus en plus utilisés dans l'industrie

Anon. *Rev gén Mécan Elect* 1959 Vol 43 (128) pp 67-69 (Dec) (In French)

4 illustr. *K* *Vwghb.25*

**New methods for machining conical surfaces**

N. P. Labazov. *Russ Engng J* 1959 (4) pp 58-59 (Original in Russian)

1 illustr. *D* *Az Ceq*

**Spark machining and its development**

D. W. Rudorff. *Metal Treatm* 1960 Vol 27 (172) pp 3-14 (Jan)

Outlines the development of spark machining and discusses technical aspects of spark and spark-arc machining with reference to stock removal rate, working area and surface finish. The article also deals with the application of spark machining techniques in blanking and forging-die manufacture. 6 illustr.

*D* *Ceqm.132/Ceqm.21*

**Spark machining is taking its place as a major metal-working process**

J. A. Weller. *Canad Mach, Annual Directory (1960)* 1959 Vol 70 (12) pp 186-189 (Dec)

The process of spark machining and its applications are described. 13 illustr. *D* *Ceqm*

**Linear tachometry for machine tools**

M. J. C. Fowell, A. Cowley. *Control* 1960 Vol 3 (19) pp 80-83 (Jan)

An article on some possible methods of obtaining electrical signals, proportional to linear slide velocity in a machine tool, for the purpose of automatic control. The typical features of several methods and the relative merits of these are summarized. 5 illustr, 7 ref, 1 table.

*D* *Pr Wp*

**LITERATURE REQUESTS**

**When applying for the loan of literature abstracted in this journal, please quote the title of the article, the name of the author, and the number of the page on which it appeared.**

**Physics and the machine tool industry.** Physique et industrie mécanique

Anon. *Machine-Outil Franç* 1960 Vol 25 (150) pp 99, 101, 103, 105 (Jan) (In French)

Among exhibits at the exhibition of the Société Française de Physique was an ultrasonic grinding machine 'Perfosonic', produced by Réalisations Ultra-soniques for the drilling, cutting and milling of workpieces for which standard processes cannot be used. Grains of abrasive material, suspended in liquid, are directed against the material to be ground by an injector transmitting ultrasonic waves. 7 illustr. (To be cont). *K* *Chcz*

**BP 821,718** (Dec 5, 1956) **J. L. Adcock, Wickman Ltd**
**Electro-erosion of metals**

Production of straight short holes, especially in sintered tungsten carbide, causes difficulties if the diameter is below a certain size. It has been regarded as exceptional if a hole could be made of 0.008 in. diameter and 0.06 in. length. The difficulty appears to be due at least partly to short circuiting of the spark gap. It has been found that the employment of a straight tubular electrode through which a steady stream of clean dielectric fluid (kerosene) is forced to the spark gap can solve the problem provided a trepanning action is prevented. This is the case if the bore diameter is not more than twice the length of the spark gap between electrode and workpiece. The electrode is to be supported by a guide closely adjacent the face of the workpiece. The bore may be eccentric in which case the electrode is to be rotated about its longitudinal axis. Longitudinal vibration of the work-piece may be advantageous. (4 claims).

*J* *Bkcb:Az Ceqn.545*

**BP 824,679** (Sep 5, 1956) **L. Benes, Vyzkumny ustav pre Mechanizaciu a Automatizaciu**
**Arrangements for the automatic control of electro-erosive machines**

The efficiency of electro-erosive saws is increased by keeping the working current constant for a certain cutting rate, or changed in dependence on the shape of the workpiece by automatic control, as against manual regulation of the pressure between cutting and work-piece. The automatic control is characterized by an electro-dynamic device with a movable coil traversed by a current and exerting pressure between tool and workpiece. This current is influenced by the cutting voltage and by an adjustable reference voltage. The difference between these voltages vary the position of the coil. Fluctuations in the cutting current thus produce movements of the coil and vary the pressure between workpiece and saw so as to restore the cutting current to the desired value. (5 claims, 3 illustr).

*J* *Ceqm Pr.545*

**DAS 1,061,917** (Nov 21, 1956) **R. Ruehle, Robert Bosch GmbH**
**Method and device for producing perforations in bodies by means of corpuscular rays.** Verfahren und Einrichtung zum Erzeugen von Durchbruechen in Koerpern mittels Korpuskularstrahlen

The method refers in particular to the production of holes in fuel nozzles for injection combustion engines. The problem was to control the electron ray in dependence on the dimensions of the hole without interrupting the process by repeated examination of its progress. This has been achieved by filling the closed nozzle interior with an inert gas under a certain pressure, and measuring the gas flow by a mercury manometer whose head controls switches to influence or cut off the current and intensity of the electron ray. (9 claims, 1 illustr). Ref cited : 1 G Appl.

*J* *Az Ceqn.545*

**DAS 1,061,005** (Nov 24, 1952) **C. Ballhausen, Deutsche Edelstahlwerke AG**

**Manufacture of electrodes for spark erosion.** Herstellung von Elektroden zur Funkenerosion

Up to now electrodes have been profiled by chip producing machining which, owing to the constant wear of these electrodes and the frequent need for several electrodes for eroding a single workpiece, is expensive and time-consuming. A much simpler and cheaper method is spray-coating the electrode. Preference is given to copper but other metals or alloys may also be used. Up to 30% non-metallic materials may be added, *eg* aluminium oxide. The advantage is that such electrodes do not wear so much as pure metal electrodes. The non-metallic aluminium oxide furthermore automatically keeps the electrode properly spaced from the workpiece surface. (4 claims). Ref cited : 2 GP ; 2 DBP ; 4 USP ; 2 periodicals ; 1 book.

*J* *Ag Qc:Ceqm.545*

## PRODUCTION, GRADING & RECOVERY OF ABRASIVE PARTICLES

**Man-made vs natural diamond powders**

S. Kay, E. F. Warren. *Grinding & Finishing* 1959 Vol 5 (8) pp 35-36 (Dec)

The authors claim that, both in preparation and use, synthetic diamonds are superior to natural for the micron size particles used in diamond powders. The report covers powders in the 0.2 μ to 30-60 μ range, and tests carried out at Superior Tube Co are quoted. 5 illustr.

*D* *Kmg*Kmh*

**Determination of particle size by β-back scattering**

P. Connor, W. H. Hardwick, B. J. Laundy. *J appl Chem, Lond* 1959 Vol 9 pp 525-531 (Oct) ; *IMM Abstr 1959/1960* Vol 10 (2) p 46 (Dec-Jan)

*D* *Vgf*

**Symposium on particle size measurement—STP234**

Anon. *Sci Lubric* 1960 Vol 12 (1) p 22 (Jan)

Book, ASTM, Scientific Publications, 1959, 308 pp. Price $6.25.

Includes sections on methods of particle size analysis, light scattering instrumentation, *etc.*

[Not in library of Industrial Diamond Information Bureau].

*D* *Vgf*

**Review and evaluation of methods of particle size analysis. I. The definition of terms and classification of sizing methods. II. Sieve analysis**

R. F. Pilgrim. *Canada : Dept of Mines, Inf Circ IC106,* 1958 (Nov) ; *Brit Ceram Abstr* 1959 (11) p 395A (Nov)

*D* *Vgf*

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**USP 2,902,153,** (Apr 20, 1956) **J. Green, California Research Corp**

**Particle separation utilizing a magnetized fluid**

Precise separation of particles according to density and/or shape is often required, *eg* in geochemical work for separating zircons from a sand matrix, and flotation methods have not been found suitable owing to high costs, slowness, and inaccuracy because of the minute differences in density in many cases. An apparatus effecting a separation of non-magnetic particles quickly and accurately consists of a vertical tube which contains a suspension of a magnetic material colloidally dispersed in a suitable liquid. Electromagnetic coils are arranged along the tube. A first coil produces a first magnetic field, its strength varying progressively along the length of the tube to vary the viscosity of the fluid as a function of this strength. After a suitable period, an optimum degree of separation of the particles is obtained which have distributed themselves in the variable viscosity according to their density. Then a set of secondary coils is energized to produce a number of localized electromagnetic fields at different zones of considerable greater magnitude than the first field. They solidify the colloidal suspension into spaced " disks ", physically segregating the fractions. The first field is then removed and the suspension with the entrained non-magnetic particles drawn out of the tube at points between the disks. (12 claims, 1 illustr). Ref cited : 2 USP.

*J* *Ccz.545*

## TOOL PRODUCTION

**X-ray orientation makes diamonds work harder**

Anon. *Amer Mach* 1960 Vol 104 (1) p 85 (Jan 11)

The Diamond Research Laboratory, Johannesburg, and Armour Research Foundation, Chicago, have developed an X-ray technique by which the hardest plane of a diamond can be found to make an oriented diamond truing tool. An oriented diamond is mounted just perpendicular to the wheel, instead of at a slight angle to wheel rotation. In addition, diamond slabs, not octahedron points, can be applied to wheel truing. This shape presents a constant contact area to the wheel and so improves wear ; since the diamond is more easily held in the metal matrix of the holder, longer life results. Some 85% of the slab can be used, compared with only 25% of an octahedron point.

This idea could be applied to single-point turning and boring tools. An oriented diamond must be formed to single-point shape with the hardest direction of the tool aimed straight at the work, as in a truing tool. A oriented diamond can be sawn into several slabs to several tool tips, where formerly the diamond could be made into only one tool. Because the slabs have uniform cross-sections, they can be worn down 85% without change in the area that touches the work, in effect providing ' throwaway ' truers. Vector-oriented diamond cutting tools will need more careful selection than usual but should last considerably longer. 3 illustr.

*D* *F Ubc Uklb*

**Ceramics for machine tools : I, II**

R. M. Gill, G. Spence. *Ceramics* 1958 Vol 9 (114) pp 30, 32-34 ; (115) pp 27-31 ; abstr *J Iron St Inst* 1959 Vol 191 (2) p 208 ; *Ceramic Abstr* 1960 Vol 43 (1) p 1 (Jan)

A review is given of compositions, structures, and physical properties with data on performance.

*X* *Pdd*

**Titanium-carbide tool bits for machining**

Ford Motor Co. *Machinery, NY* 1960 Vol 66 (5) p 128 (Jan)

Titanium carbide tool bits, with a dense and very fine-grained structure composed of a uniform dispersion of titanium carbide in a metal binder of nickel and molybdenum, have been developed by the Ford Motor Company. The steel-cutting grades, used for semi-finish and finish machining, have a hardness range of 90 to 93 Rockwell A. *D* *Pd Rgc*

**Sintered alumina cutting tools**

R. N. Cook (Wickman Ltd, Coventry). *Engng Mater & Design* 1958 Vol 1 (3) pp 149-151 (Dec); *Metal Powd Rep* 1959 Vol 14 (3) pp 43-44 (Nov)

Reviews the present position with regard to sintered alumina tips for cutting tools, and compares their performance with that of carbide tips. Points out the need for much more knowledge concerning the wear of sintered oxide tools. Concludes that these will be complementary to carbide tools, and can immediately find a small field of application on modern machine tools for high speed finishing cuts, in the speed ranges beyond those normally provided for by carbides at the present time. Includes some interesting graphs. *X* *Pdcb*Pdz Rjb*

**Technological improvements.** Verbesserung der Technologie

Anon. *Fertigungstechnik u Betrieb* 1959 Vol 9 (12) p 739 (Dec) (In German)

A hollow-grinding insert has been developed by the Industriewerk Karl Marx Stadt for use with the steel grinding machine SWSt 60. Advantages claimed include higher grinding speeds, which are made possible because friction is reduced as a result of the smaller cutting surface of the hollow tool. *K* *Chc.1313*

**Carbide boring bar halves machining time**

L. T. Parker. *Tool Engr* 1960 Vol 44 (1) pp 98-100 (Jan)

Rigidity of carbide makes it an excellent material for long boring bars. Close tolerances can be held and metal removal rates are higher than with steel bars. 3 illustr, 1 table. *D* *Plk Rg*

**Beneficial reduction**

Anon. *Metal Ind, Lond* 1960 Vol 96 (5) p 82 (Jan 29)

The alumina copper cermets containing 0.5-20% (preferably 4-8%) of copper, in which the alumina particles are separated by not more than 100 μ, have an improved impact strength which is not affected by the presence of minor flaws, and an improved resistance to abrasion which renders the materials suitable for cutting tools. *D* *Blf Ungc*

**Further progress in the field of oxide and carbide ceramics and their application.** Weitere Fortschritte auf dem Gebiet der Oxyd-Karbid-Schneidkeramik und deren Anwendung

H. J. Randhahn. *Industr Anzeig* 1960 Vol 82 (2) pp 11-14 (Jan 5) (In German)

12 illustr. *K* *Pdc/Pdd*

**BP 819,330** (Sep 2, 1959) **H. G. Randell**

**Cylindrical and segmental grinding wheels**

Cutlery grinding cylinders are reinforced so as to prevent the formation of cracks during the moulding operation or during grinding, or to keep the cylinders serviceable despite any fine cracks which may have developed, by moulding the abrasive composition inside an outer cylindrical shell, or an outer and inner shell, of tough material that is materially softer than the abrasive so that it is readily worn away at the edges of the working face. The material may be 1/16 in. thick resin-impregnated glass fibre, nylon, fabric or such bonded laminate, or soft metal (aluminium, copper, brass). The reinforcement is gradually worn or readily cut back progressively until completely worn off. (6 claims, 5 illustr). *J* *Chcl Pr.545*

**BP 821,929** (Oct 25, 1956) **F. S. Shelton, B. S. Parkyn, Trubenised (Gt Britain) Ltd, Scott, Bador & Co Ltd**

**Abrading or scouring material**

A flexible yielding synthetic cellular mass of a cured polyurethane foam, in which particles of abrasive material are distributed throughout, is particularly useful for abrading parts of irregular or unusual profile difficult to treat with relatively rigid abrasive material. The material may be formed into sheets, strips, or blocks and may be mounted on any suitable backing. Disks may be cut from the abrasive foam and mounted for use as grinding or buffing wheels or attached to endless belts. Short lengths of fibre glass yarns may be incorporated in the abrasive foam mixture. (11 claims). *J* *Bp Cs Pe.545*

**USP 2,900,767** **R. Voeller, Fortuna-Werke Spezialmaschinenfabrik AG**

(Nov 20, 1957—conv date, Germany)

**Fine feed mechanism for grinding machines and the like**

It is frequently necessary that the removal of material be exact down to some 0.001 millimetre. The feed of the grinding wheel is then often merely a fraction of a micron. Perfect grinding requires further exceptional rigidity of the structure against vibrations. Present machines cannot combine rigidity and very fine feeds whether using mechanical feeding devices, *eg* screws, gears, cams, differential feeds, or hydraulic feeds, so that it is suggested that the grinding speed or time be regulated according to intermediate measurements. Difficulties are overcome by effecting changes of length of a connecting rod between workholder and toolhead by heating or cooling. (12 claims, 1 illustr). Ref cited: 4 USP. *J* *Chc.21.545*

**USP 2,901,826** (Jan 31, 1957) **E. A. Kline, R. E. Crouse, R. F. Leu**

**Dental cutting tool**

The most commonly used tools are steel burrs with shaped teeth. Cutters of sintered tungsten carbide or having diamond particles embedded in a copper-nickel matrix have also been used but only to a limited extent. They are costly, quite small, and comparatively fragile. Therefore steel burrs are preferred by most dentists. It has been found that application of a thin, hard refractory carbide coating to a shaped steel burr can lengthen its service life to up to ten times the effective life of an uncoated burr, which is usually less than one minute. The coating should have a thickness of from about 0.0004 in. to about 0.001 in. and be of a lamellar structure. The coating can be applied in any manner, *eg* using the method of USP 2,714,563, by feeding the starting material (90% tungsten, 7% cobalt, 3% carbon) at a controlled rate into a chamber in which detonations of mixtures of air or oxygen with hydrogen (acetylene, propane) are caused by sparking. The coatings thus produced consist of 7% cobalt, 87% various tungsten carbides and 6% tungsten. The coating presents abrasive surface. (2 claims, 4 illustr). Ref cited: 3 USP. *J* *Nhf.545/Pld.545*

**DAS 1,062,567** (Feb 11, 1958) **H. Krug, Diskus Werke Frankfurt a/M AG**

**Clamping device for detachably securing grinding bodies to their carrier disk.** Spannvorrichtung zur loesbaren Befestigung von Schleifkoerpern an ihrer Tragscheibe

Fig 28 is a section through the device where 2 represents a grinding wheel fixed to its carrier disk 1 by ring 6. An expansion bolt 4 is set in aperture 3 which is characterized by chamber 8 and annular space 9 connected by ducts 10. Chamber, ducts and ring space are filled with oil 4. 11 is a piston, 12 a sealing ring.

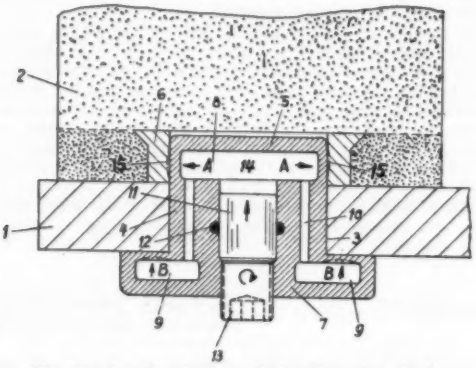


*Fig 28. Sectional view of the clamping device. DAS 1,062,567.*

On pushing piston 11 in the direction of the arrow by turning screw 13, pressure rises in oil-filled chamber 8 and ring space 9 expanding the bolt where the walls are thin, as indicated by the arrows. (3 claims, 1 illustr). Ref cited : 4 GP ; 2 DBP ; 2 Swiss P ; 1 FP ; 2 USP. (Add DAS 1,055,994).

*J* *Pe Qec.545*

**DAS 1,064,375** **G. F. Keeleric, Boart Products South Africa Ltd**
(May 26, 1953—conv date, USA)

**Method of manufacturing a grinding tool with interrupted abrasive layer.** Verfahren zur Herstellung eines Schleifwerkzeugs mit unterbrochenem Schleifbelag

The method refers to a grinding tool with an electrolytically applied coating of metal and diamond particles embedded therein. A known method makes use of a soft synthetic resin layer to stick on the diamond particles. The thickness of the layer and the average length of the particles is determined before pressing the particles through the layer, whereupon the resin layer surface is made electrically conductive. This lengthy procedure can be avoided by making the synthetic resin layer so thin as to lose its insulating property, so that the galvanic current can flow through it resulting in a uniform metal coating. The adhesive coating may be applied by means of a rubber stamp of the desired pattern. For simple patterns a brass knurling roll may be used. (1 claim, 3 illustr). Ref cited : 3 DBP ; 1 GP ; 3 Austrian P ; 1 Swiss P ; 2 BP.

*J* *Ab Bp Cs.545*

**LITERATURE REQUESTS**
**Please quote the page number of the journal which contains the original reference, and the author and title of the article, in all cases.**

**DAS 1,064,844** (Jan 16, 1957) **T. Sachs**

**Method of manufacturing grinding or cutting-off wheels.** Verfahren zur Herstellung von Schleif- oder Trennscheiben

The method is characterized by the use of very thin carrier sheets without any resin impregnation. The resin coated abrasive particles are sprinkled onto the carrier sheets and fixed by short infra-red heating, then the sheets are superposed in layers and formed into wheels by heat and pressure. Tissue paper sheets are especially suitable as carriers. Resin impregnated paper or textile layers may be interposed between the abrasive sheets to reinforce the wheels. (3 claims). Ref cited : 1 G Appl ; 1 DRGM ; 1 BP ; 4 USP.

*J* *Ab Cs.545*

## POWDER METALLURGY

**Silicon nitride—a new high-temperature material**

Admirality Materials Lab, Metallurgy Div. *Machinery, Lond* 1960 Vol 96 (2461) pp 98-99 (Jan 13) ; N. L. Parr (Admiralty Materials Lab). *J Royal Naval Scientific Service* 1960 Vol 15 (1) pp 34-38 (Jan)

See *Industr Diam Abstr* 1960 Vol 17 p A52 (Feb).

*D* *Blz Ceq N/Blz U*

**Vibratory ball mills**

Apex Construction Ltd, 15 Soho Sq, London W 1. *Industr Diam Rev* 1959 Vol 19 (227) p 198 (Oct)

The advantages of vibratory ball mills as compared to rotary mills are indicated by the increasing use of the former in powder metallurgy. The materials in both types of mill are similar : the difference lies in the new use of these materials. The operation of a typical vibratory mill is described. 1 illustr.

*D* *Cfjc Pr*

**The future of powder metallurgy**

F. V. Lenel. *Bull Amer Soc Test Mat* 1959 (242) p 42 (Dec)

Dr Lenel predicts that powder metallurgy will be used increasingly for products of closely controlled composition and purity, for products with structures and properties not attainable by fusion metallurgy, and for more economical wrought products.

*D* *Vwlb*

**Metal powder tools reduce vibration**

Anon. *Mech World* 1960 Vol 140 (3486) p 24 (Jan)

The excellent damping capacity and relatively low cost of copper-infiltrated iron powder parts are being used to advantage in the design of cutting tools. The use of powder metallurgy for boring bars, shanks, milling cutter bodies, *etc*, results in longer operating life, better surfaces, closer tolerances and faster cutting speeds, according to Horace Frommelt, Director of the Metal Cutting Centre of Spring Garden Institute. The main reason for these advantages is the substantial reduction of vibrations.

*D* *Pd Qt Uq*

**Salt and water reclaim tungsten carbide**

Anon. *Amer Mach* 1959 Vol 103 (27) p 77 (Dec 28)

Hard materials can now be pulverized without mechanical hammering—solely by using the natural expansion of water of crystallization to split material into fine powder. Even scrap sintered tungsten carbide can be recovered as pure tungsten carbide powder with a new method developed in Japan.

*D* *Ba Cl Scd Sg*

## MISCELLANEOUS

**Lubricant problems in industry.** Schmierstoffprobleme im Industriebetrieb

G. Gebauer. *Schmiertechnik* 1959 Vol 6 (6) pp 270-272 (Nov-Dec) (In German)

*K* *Sk*

**Machine tool atlas.** Werkzeugmaschinen-Atlas

W. Schmidt. *Schmiertechnik* 1959 Vol 6 (6) p 294 (Nov-Dec) (In German)

Book, VDI Verlag GmbH, Duesseldorf, 1959. Price DM 31.80.

Well-arranged examples of machine design from prominent firms accompanied by a short text. The book is intended for students, young designers and practical machine tool designers.

[Not in library of Industrial Diamond Information Bureau]. *K* *Pr.256*

**Cutting fluid additives—where to use them, how to choose them**

R. A. Fitch. *Plant Engng* 1959 Vol 13 (10) pp 116-118 (Oct)

3 illustr. *A* *Sj*

**A cantilever indicator stand for precision inspection**

National Physical Laboratory, Teddington. *Mach Lloyd* 1960 Vol 32 (2A) pp 24-26 (Jan 23)

4 illustr, 3 ref. *D* *Qd V*

**Historical diamonds : 'The Jubilee'**

Anon. *'Mindrill' Bits & Pieces* 1959 Vol 12 (7) p 5 (Nov)

*D* *F.28*

**Metalworking machines from U.S. [:] rolling mills were saving grace**

Anon. *Canad Mach, Annual Directory (1960)* 1959 Vol 70 (12) pp 184-185 (Dec)

1957-1959 figures for drilling, broaching, boring and grinding machines. Diamond dies for power metal-working machines are included.

*D* *Bf Ceq.25/Nkb.25*

**A shortcut to determine machinability**

A. Ashburn. *Amer Mach* 1959 Vol 103 (27) pp 69-71 (Dec 28)

With a few short cutting tests and the mathematical approach described here, it may be possible to solve machinability problems in a fraction of the time needed for complete tool life testing. 2 illustr.

*D* *Unp.21*

**Third West Coast National Meeting covers broad range of materials**

Anon. *Bull Amer Soc Test Mat* 1959 (242) pp 5-15 (Dec)

Includes reports of ceramics in nuclear energy, non-destructive testing and materials in the electronics industry. *D* *Bl.25:.231/Cy.231*

**Fully automatic machining cycles**

Anon. *Mach Tool Rev* 1959 Vol 47 (282) pp 129-137 (Nov-Dec)

The development of automation is traced and modern applications are illustrated. 13 illustr.

*D* *Pr.133:.132*

**The changing pattern of world machine tool markets**

Anon. *Metalworking Prod* 1960 Vol 104 (2) pp 78-79 (Jan 13)

World production figures, 1955-1957, for cutting and forming type tools are given and analyzed. Exports, imports and prices are covered. 5 tables.

*D* *Pr.251.31*

**Distinguishing and classifying materials by optical means.** Ueber die lichttechnische Kennzeichnung und Klassifikation von Baustoffen

J. Krochmann. *Glastech Ber* 1960 Vol 33 (1) pp 20-24 (Jan) (In German)

8 illustr, 15 ref, 2 tables.

*K* *B Ccz Wc*

**Expansion of engineering industries in Australia**

Anon. *Commonw Engr* 1959 Vol 47 (3) pp 38-42 (Oct)

A section on machine tools deals with grinding, drilling and milling machines. Local industry supplies only one third of Australian demand for machine tools.

*D* *Pr.25.38*

**General geology II. Structure of the earth's crust, formation of rocks and deposits.** Allgemeine Geologie II. Zusammensetzung der Erdkruste, Entstehung der Gesteine und Lagerstaetten

R. Kettner. *Montan Rdsch* 1959 Vol 7 (12) Book suppl (Dec) (In German)

Book, VEB Deutscher Verlag der Wissenschaften, Berlin, 1959, 368 pp, illustr. (In German).

[Not in library of Industrial Diamond Information Bureau]. *A* *Vwc*

**Geology and the science of rocks.** Geologie und Gesteinskunde

H. Saerchinger. *Glueckauf* 1959 Vol 95 (19) p 1220 (Sep 12) (In German)

Book, Volk & Wissen VEB, Berlin, 1958, 353 pp, illustr, 5th ed. Price DM 13.30. (In German).

[Not in library of Industrial Diamond Information Bureau]. *A* *Vwc*

**Results of workshop experience in cleaning metal surfaces by ultrasonic means.** Betriebserfahrungen beim Reinigen von Metalloberflaechen durch Ultraschall

K. Froehlich. *Metalloberflaeche* 1960 Vol 14 (1) p 10 (Jan) (In German)

*K* *Bf Unf:Cdbz*

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## IDR REPRINT SERVICE

The following Reprints are now available from Industrial Diamond Information Bureau, 2 Charterhouse Street, London EC 1, at a charge of 1s each, post free :

C 98—The resistance of diamond to abrasion, by E. M. Wilks and J. Wilks (*Phil Mag* 1959).

I 252—A new method of determining the average shape of diamond and other particles, by J. F. H. Custers and F. A. Raal ; A counting device for diamonds, by F. A. Raal, (*IDR* 1959).

I 253—Factors affecting the efficiency of resinoid-bonded diamond wheels, by R. G. Weavind (*IDR* 1959).

**Production engineering developments in the Soviet Union**
D. F. Galloway. *Prod Engr* 1960 Vol 39 (2) pp 79-104 (Feb)

Includes sections on ENINS — the Experimental Scientific Research Institute for Machine Tools; and on VUOSO, the Czechoslovak Machine Tool and Metal Cutting Research Institute. 26 illustr.
*D* *Vwkl.132.33*

**Considerations when calculating costs for the purpose of machine design.** Betrachtungen fuer Kostenermittlung im Formenbau
H. J. Joos. *Industrieblatt* 1960 (1) pp 37-41 (Jan 25) (In (German)

5 illustr, 8 tables. *K* *Pr.145*

**The development of machine tool construction in the 7-year plan**
A. J. Prokopowitsch. *Sowjet Buchneuerschein Vorankuendigungsdienst* 1959 (44) p 16 (Original in Russian)

Book, Mashgis, 1960, 112 pp. Price DM 1.50.
[Not in library of Industrial Diamond Information Bureau]. *A* *Pr.132.33*

**Speed and accuracy in machining**
Anon. *Mech World* 1960 Vol 140 (3486) pp 15-18 (Jan)

A demonstration of machine tools, exhibited earlier in Paris, was held at the London showrooms of Alfred Herbert Ltd, Coventry. Some of these are described here with a view to illustrating modern machine tool performance. 9 illustr. *D* *Pr.27*

# PUBLICATIONS RECEIVED

## BOOK REVIEWS

**A survey of gear hobbing practice, PERA Report No 67**
Anon. Production Engineering Research Association of Great Britain, Melton Mowbray, Leics. 55 pp, illustr (Nov, 1959)

A survey of current hobbing practice to determine the principal factors affecting costs and production ranges in production hobbing operations, was limited to an investigation of methods used by UK firms engaged in regular production of spur or helical gears, gear hobs or hobbing machines.
*D* *Ad Cfq.1456.57*

**Handbook of Brinell, Rockwell, and Vickers hardness testing.** Handbuch der Haertepruefung nach Brinell, Rockwell, Vickers
Georg Reicherter, Esslingen aN, Germany. 1958, 136 pp, appendix of tables, 70 pp, illustr. (In German)

This book is not intended to be a textbook for students but is designed for those in charge of workshops, *eg* those who may wish to simplify or render more efficient the systems they use. In this second edition is included additional information on small load Rockwell and Vickers hardness testing. Automation in hardness testing is given particular attention. The DIN standards which have come out since the publication of the first edition are set out and discussed. Apart from these innovations, the book contains a short dissertation on the basic theory, descriptions of different types of machines, and numerous hardness value tables.
*A* *Cv.57*

**Which stone is this ?** Welcher Stein ist das ?
R. Boerner. Kosmos Gesellschaft der Naturfreunde, Franckh'sche Verlagshandlung, Stuttgart. 1958, 176 pp, illustr. Price DM 8.50. (In German)

This book is a low-priced yet comprehensive aid to the identification of minerals and is intended for a wide range of readers. The material is divided into three sections. The first lists 200 different minerals, according to colour, and deals with their important characteristics. The second is limited to gemstones and discusses value, imitation stones and misleading characteristics; while the third concerns the properties, composition and technical applications of the most important kinds of natural rock. The book is well illustrated with colour-plates and drawings. *K* *Bb Ccb*

**Werkstatt u Betrieb Yearbook 1960.** Werkstatt u Betrieb Kalender 1960
Carl Hanser Verlag, Munich. 1960, 332 pp, illustr, tables. (In German)

As in previous years, the main section consists of classified abstracts taken from the most important technical publications of the past year. A detailed subject index is included. There are three original articles on topical subjects: 'The use of the slide rule' by A. Walther and O. Roth; 'Analogue and digital measurement' by H. W. Politsch; and 'Cast-iron, malleable iron and modular cast-iron' by H. Hentze. In addition, there is a diary containing memorable dates for the engineering industry. The volume includes a directory of libraries, technical colleges, societies and associations, official inspection and testing departments, and manufacturers. *K* *Vwk.515*

## TRADE LITERATURE

**Dotco pneumatic tools—straight air grinders, Bulletin 102**
Doeden Tool Corp, Sherwood, Ohio. 4 pp, 8½ × 11 in., illustr

A bulletin dealing with Dotco Series 1 and 2 straight air grinders gives specifications and tool application data. *D* *Chc Pr.57*

**Dotco pneumatic tools, Bulletin 101**
Doeden Tool Corp, Sherwood, Ohio. 4 pp, 8½ × 11 in., illustr

Descriptions of Dotco high-speed tools for contour finishing and grinding of dies, for finishing moulds, patterns, forgings and castings, and for deburring machined parts. Various types are available for different applications. Advantages claimed include cool running and freedom from vibration at higher speeds, greater torque and horse-power than any tool of equivalent size, and fast, easy, cheap operation. A price list is given. *D* *Chm Pd.57*

**Wellson diamond impregnated wheels**

Wellson Abrasive Products Ltd, Brownfields, Welwyn Garden City, Herts. 24 pp, 6 × 9½ in., illustr

Wellson Abrasive Products Ltd manufactures both resinoid bonded and metal bonded diamond wheels. This catalogue deals with both types and gives specifications for the various wheels in each catagory: these include peripheral wheels, straight cup, taper cup-rim, and double cup wheels, as well as dish wheels. Hand hones and chipbreakers are available. A table of speeds and a price list are provided.

*D* *Nv.57*

**New Morse production drill point grinder**

Morse Twist Drill & Machine Co, New Bedford, Mass. 4 pp, 8½ × 11 in., illustr

The machine grinds any type of point with high precision. A calibrated swivel fixture grinds a conventional point on drills with an included angle of 118° to 150°. Fixtures are available for lesser angles and for extending the drill length from 6 in. maximum to 12 in. maximum. Wet grinding is the method used and a manually operated swing type dresser is provided.

*A* *Alb Chc Pr.57*

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# PATENT LISTS

## BRITISH

*The Official Journal (Patents) 1959 (3698) (Dec 31)*

828,771 INGERSOLL-RAND CO. Rock drills.

829,157 HOOGLAND, M. (trading as HOOGLAND, ING, E.). Knife grinding devices.

829,063 LINDER GmbH, H. Devices for use with grinding machines for compensating reduction of material in the grinding disk.

829,167 GUEHRING, O., GUEHRING, A., and GUEHRUNG, M. (trading as GOTTLIEB GUEHRING). Machines for grinding the points of twist drills.

829,173 LINDNER GmbH. Truing devices for thread grinding disks.

*The Official Journal (Patents) 1960 (3699) (Jan 6)*

829,364 HOBSON LTD, H. M. Grinding machines.

829,516 AUTOFLOW ENGINEERING LTD. Grinding machine.

*The Official Journal (Patents) 1960 (3700) (Jan 13)*

830,142 CAVITRON CORPORATION. Sonic and ultrasonic cutting tools.

*The Official Journal (Patents) 1960 (3701) (Jan 20)*

830,560 GENERAL ELECTRIC CO. Method of making garnet.

830,743 GENERAL ELECTRIC CO. Method of making diamonds.

*The Official Journal (Patents) 1960 (3702) (Jan 27)*

831,121 LADINSKY, W. Diamond truing devices for abrasive cutters.

830,917 SPARCATRON LTD, and RUDORFF, D. W. A. F. Methods and apparatus for shaping, grinding or polishing articles of electrically conductive materials.

## UNITED STATES

*Official Journal 1959 Vol 749 (1-5) (Dec)*

2,914,888 T. F. McDOUGAL, W. R. O'DELL. Bit grinder.

2,914,892 E. FOUQUET. Process and arrangement for simultaneous lubrication and cooling of the piece of work and the cutting tools during machining operations.

2,914,937 A. R. MORE, H. W. WALLACE & CO LTD. Hardness tester.

2,914,938 L. H. LAAKSO, M. E. ABBOTT. Apparatus for investigating surface profiles.

2,915,284 J. E. ORTLOFF, JERSEY PRODUCTION RESEARCH CO. Reservoir coring.

2,915,285 F. H. DEILY, JERSEY PRODUCTION RESEARCH CO. Coring subterranean formations.

2,915,291 L. GULFELT. Cross shaft rotary drill bit.

2,915,854 H. L. ETTMAN. Microtome knife stroppers.

2,915,855 E. A. THOMPSON. Centerless grinder attachment.

2,915,856 B. CRETIN-MAITENAZ, SOC INDUSTRIELLE ET COMMERCIALE DES OUVRIERS LUNETIERS (COTTET, POICHET, TAGNON ET CIE). Machine for grinding an optical surface in a piece of refractive material.

2,916,368 A. M. SUGA, SIMONDS ABRASIVE CO. Abrasive article.

2,916,460 R. R. VAN DER BECK jun, CARBORUNDUM CO. Silicon carbide resistance bodies and methods of making same.

2,916,857 R. E. DARGIE, AMERICAN OPTICAL CO. Lens surfacing machines.

2,916,858 A. F. HUDSON. Contour forming machine.

2,916,951 E. A. CARLSON, C. J. PRYOR, OLOFSON CORP. Hydraulic mechanism for retracting diamond boring tool.

2,917,873 P. D. JEWTT, TRANSITRON ELECTRONIC CORP. Machine for cutting germanium, silicon, quartz and other hard materials.

2,917,874 K. F. LIERSE, THOMPSON RAMO WOOLDRIDGE INC. Machine tool.

2,917,919 R. SCHULZE, H. BROSCHKE, ERNST LEITZ GmbH. Hardness-testing device.

2,917,952 J. A. LAVALLEE, LAVALLEE & IDE INC. Reamer manufacture.

2,918,260 C. V. TILDEN. Core drill construction.

## SOUTH AFRICAN

*Official Journal 1959 Vol 12 (47-51) (Nov-Dec)*

59/2948 D. H. FLEMING jun, UNION CARBIDE CORP. Suspension type rotary piercing process and apparatus.

## AUSTRALIAN

*Official Journal 1959 Vol 43 (42-46) (Nov-Dec)*

224,860 WICKMAN LTD. Electro-erosion.

225,079 PITTSBURGH PLATE GLASS CO. Drilling plate glass.

225,307 LAUBMAN & PANK LTD. Glass grinder.

## SWISS

*Patentliste 1959 (21-22) (Nov)*

342,299 K. H. STEIGERWALD, CARL ZEISS. Process for working materials by means of charge carrying rays.

342,304 N. MIRONOFF, J. PFAU, ATELIERS DES CHARMILLES SA. Method and machine for electric machining.

342,441 G. R. WOELFLE, MSO MASCHINEN- UND SCHLEIFMITTELWERKE AG. Measuring device on the coordinate tables of precision drilling machines.

342,674 W. ULLMAN, AGIE AG FUER INDUSTRIELLE ELEKTRONIK. Method of removing stock by electro-erosion.

342,675 N. MIRONOFF, J. PFAU, ATELIERS DES CHARMILLES SA. Machine for electric machining.

342,676 J. PFAU, N. MIRONOFF, ATELIERS DES CHARMILLES SA. Electrode for electro-erosion and method of manufacturing this electrode.

342,862 W. STAEHLI. Machine for cutting the table of precious stones.

## FRENCH

*Bulletin Officiel 1959 Vol 76 (3943-47) (Nov-Dec)*

72,672/ 1,160,740 W. S. PRAEG, J. J. SIGMAN jun, NATIONAL BROACH & MACHINE CO. Gear grinding tool.

72,573/ 1,162,762 W. S. PRAEG, J. J. SIGMAN jun, NATIONAL BROACH & MACHINE CO. Method of finishing gear wheels.

72,248/ 1,165,087 A. STIHL. Sawing chain for chain saws with motor-control for cutting and working hard rock.

1,212,933 F. AURIAC, CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE. Automatic device for machining natural or artificial materials and in particular for preparing thin mineralogical specimens.

1,213,421 FLEXIBOX LTD. Honing machine.

1,214,132 M. G. RITTER, R. DURAND, CHRISTENSEN DIAMOND PRODUCTS CO. Core drill.

1,215,163 H. C. HOLMAN, ELECTRIC & MUSICAL INDUSTRIES LTD. Method of manufacturing phonograph needles and similar objects.

1,215,171 E. FOUQUET. Method of truing and sharpening abrasive wheels.

1,215,309 SOUDURE ELECTRIQUE LANGUEPIN. Method and device for spark machining workpieces along a practically closed profile.

1,215,501 P. HALPERN. Apparatus for cutting diamonds.

1,215,663 J. DORY, J. -J. RENAUT, REALISATIONS ULTRASONIQUES. Ultrasonic saw.

1,215,662 J. DORY, J. -J. RENAUT, REALISATIONS ULTRASONIQUES. Grinding and honing machines.

1,215,788 P. DURAND. Device for diamond truing grinding wheels for grinding helicoidal surfaces.

1,215,825 CARL ZEISS. Method and apparatus for working materials by means of a beam of electrically charged particles.

1,215,905 H. GARIH. Fixing tools in the shape of grains or plates on their tool carrier.

1,216,095 WERNICKE & CO K.-G. Truing device for grinding wheels for apparatus for grinding the bevels of spectacle lenses.

1,216,096 WERNICKE & CO K.-G. Device for controlling grinding wheels for apparatus for grinding spectacle lenses.

1,216,108 HERMINGHAUSEN - WERKE GmbH. Device for truing the control wheel on centreless grinders for cylindrical surfaces during the grinding procedure.

## GERMAN

*Patentblatt 1959 Vol 79 (51-52) (Dec); 1960 Vol 80 (1-2) (Jan)*

**Applications Open to Public Inspection**

1,072,049 H. W. ROTTER, SIEMENS-SCHUCKERT-WERKE AG. Process of making hollow bodies by electrophoresis.

1,072,061 H. SCHICHT, W. FERD KLINGELNBERG SOEHNE. Gear lapping machine.

1,072,502 A. SCHULZE. Machine for grinding and polishing optical flats.

1,072,505 G. GLUCHOWICZ, ULOSUNDA VERKSTAEDER AB. Measuring control for grinding machine.

1,072,506 W. REUTHE, FRITZ WERNER AG. Hydraulic feeding device for a tool, *eg* a grinding machine.

1,072,917 A. W. PLOEGSMA, NV PHILIPS' GLOEILAMPENFABRIEKEN. Process of manufacturing gramophone needles.

1,072,976 H. S. BLOCH, G. L. HERVERT, UNIVERSAL OIL PRODUCTS CO. Method of making aluminium oxide.

1,073,123 K. H. STEIGERWALD, CARL ZEISS, Method and apparatus for enabling the passage of fast rays, in particular corpuscular rays, between chambers of different pressures.

1,073,344 F. R. BOOSEY, SIGMA INSTRUMENT CO LTD. Pneumatic measuring control for machine tools, *eg* grinding machines.

1,073,357 J. H. DWYER, PRECISION GRINDING LTD. Engraving or copying milling machine with a pantograph.

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# INDUSTRIAL DIAMOND REVIEW

incorporating INDUSTRIAL DIAMOND ABSTRACTS

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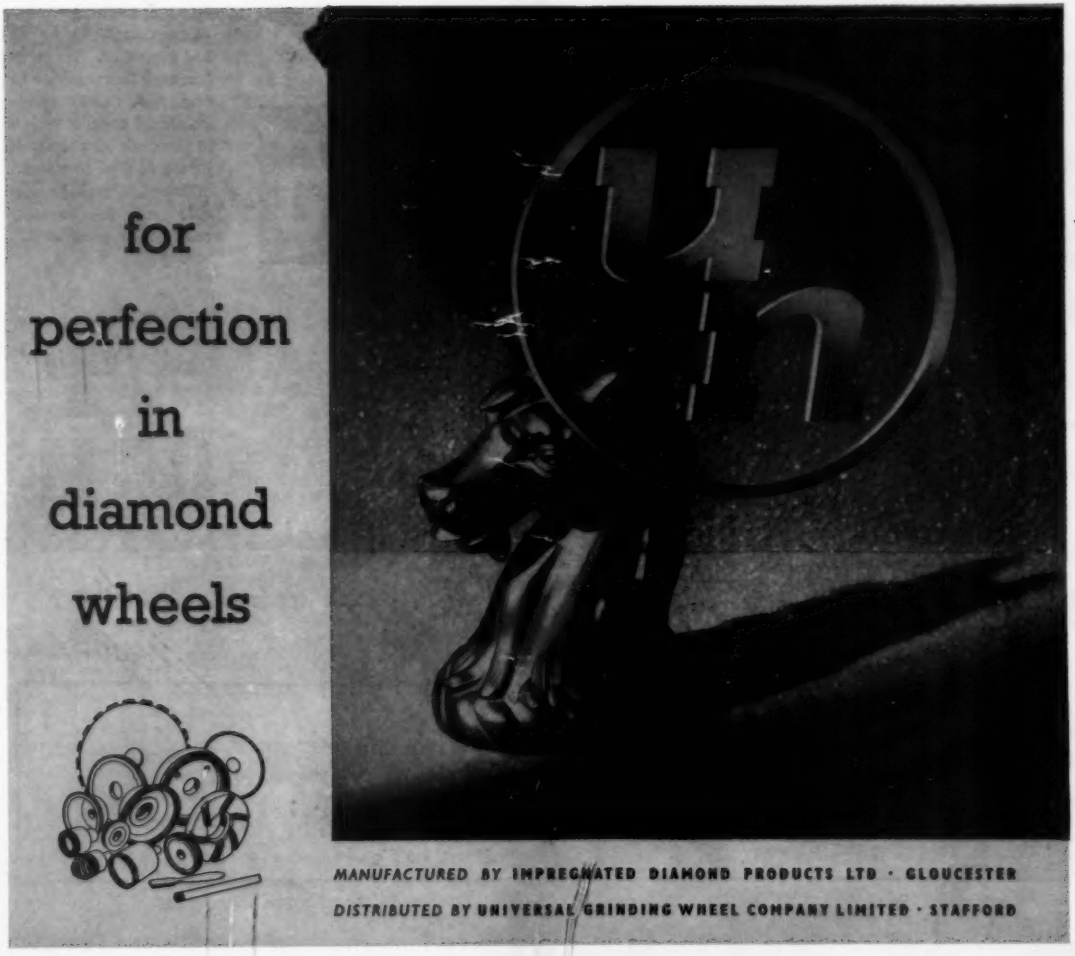
March, 1960 Vol. 20 No. 232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